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No.7 September 85p



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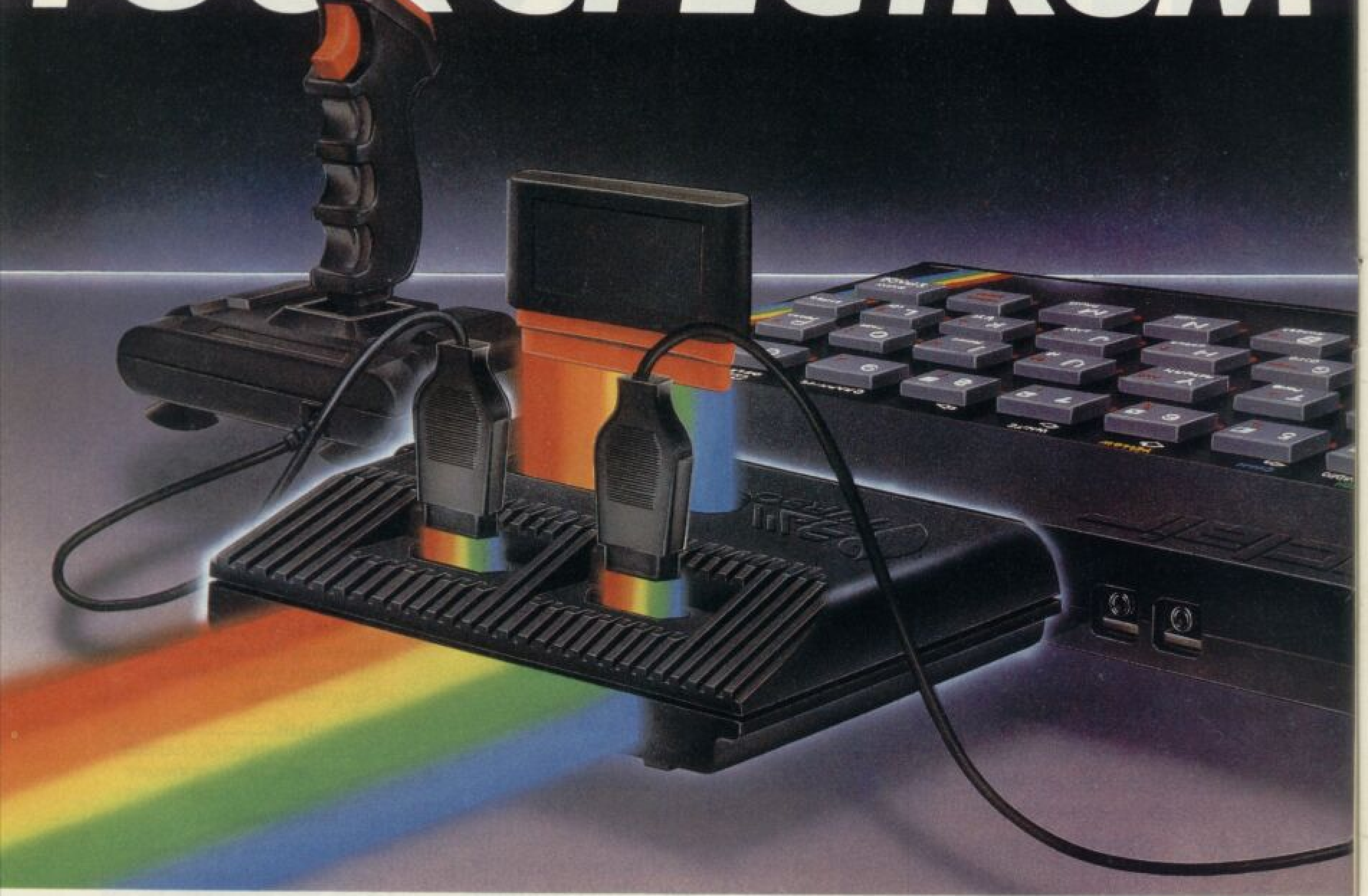




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FRONTLINES

THE MEGA- GAME'S UP!

Following months of speculation, Liverpool-based software house, Imagine, has finally bitten the dust. Rumoured to have been struggling for quite some time and now having run out of money and excuses, the company has finally been placed into the hands of the official receiver.

The reasons for failure are not likely to be known in any detail until the dust has cleared, but poor sales and a failed contract with publisher Marshall Cavendish were two major contributors to Imagine's downfall. Other contracts which Imagine was rumoured to be negotiating — with Apple and IBM — failed to materialise in time to save the company.

The deal with Marshall Cavendish was to supply software for *INPUT*— a partwork publication dedicated to the art of writing your own games. Accepting the advance of a reported £200,000, Imagine reputedly invested the same amount again in equipment to handle the job — which explains why, when Marshall Cavendish rejected the games, Imagine was left out of pocket to the tune of £400,000.

In a drastic move calculated to lift Imagine's financial situation out of the mire, the company attempted to auction off its entire range of best-selling (sic) titles. K-Tel, Prism and Virgin Software were reported to be interested parties; eventually, however, a deal was signed with distributor, Beau-Jolly. This landed Imagine in court with rival distributor Zeta Services which claimed to hold a contract giving it sole rights to the titles. Imagine made a counter-claim that Zeta had breached the contract by refusing to take delivery of existing stocks by the agreed date.



Cassette anyone? Imagine ex-director Bruce Everiss zzooms off to form a new company.

Meanwhile, back at Imagine's HQ, Technical Director Bruce Everiss (who resigned from the company, along with Information Manager Tim Best just a week before liquidation) informed us that he was in disagreement with the three other directors. Interviewed after the crash, Everiss commented that financial mis-management was a factor in the failure of the company; Financial Director Ian Hetherington felt moved to say little in reply to Everiss' 'off the record' claims, but blamed the collapse on the overheads incurred by the Marshall Cavendish contract. Mention was also made of piracy of Imagine products; Hetherington claims that 300,000-400,000 pirated tapes were uncovered not long ago. *(Could this be the first official mention of the oft-rumoured 'find' of bootlegs in a London warehouse back in January? Ed.)*

As the smoke clears amid predictable acrimony, perhaps the biggest question of all is what will happen to the so-called Mega-games — the project on which the company was devoting much of its time and resources. Due for release sometime in August at a price of £40 each, the games are said to offer graphics mid-way between ordinary micro graphics and the type of laser-disk realism seen in the amusement arcades. Modestly, Bruce Everiss was heard to say that "The Mega-games will make all other products obsolete overnight...." — a comment that seems to have back-fired somewhat.

The rights to the Mega-games already in progress when Imagine went into liquidation are now the property of the official receiver, representing a company asset which can be used to pay the estimated £$^3/_4$ million owed to creditors. The intellectual rights to the concept, however, remain the property of the copyright holders.

And this is where the plot thickens, for the 18-strong programming team of Imagine will apparently be joining former directors Ian Hetherington, Mark Butler and David Lawson, in the formation of a new company. Hetherington confirmed that the rights to the existing Mega-games are now the property of the receiver, but hinted that the new (and as yet unnamed) company would be creating its own Mega-games. Which might go some way to explaining the rumours that are flying around that Imagine's ex-programming team is presently holed up in a secret location putting the finishing touches to *Bandasnatch*. The job is reported to be 80 per cent complete.

Bruce Everiss, too, is setting up his own, separate, company but wouldn't at press time get down to the nitty-gritty of telling us what it'll be doing; under existing law, there's nothing to prevent former directors of a liquidated company acting as directors of a new company.

Watch this space for news of the emergent companies, when and if they appear.

TEXT ON YOUR TELLY

A new Teletext adaptor is now available for both the 16K and 48K Spectrum, thus giving Spectrum users all the facilities of the four Teletext channels at a fraction of the cost of a special Teletext TV. The TTX 2000 adaptor costs £145 and includes a power adaptor, ZX Interface cable and detailed instructions.

The maker, OE Ltd, happens too to be designer and manufacturer of the Prism VTX 5000 modem (which won the 1984 'Peripheral of the Year' award) and the company has also announced plans for a telesoftware program to allow all TTX 2000 users to receive and download specially broadcast software — rather like the BBC is trying out at the moment on Ceefax. The downloader facility will be available as an upgrade ROM.

GETTING THE HUMP

Camel Products has been hard at work producing even more hardware additions for the humble Speccy — this time, its four new products all relate to the use of EPROMs.

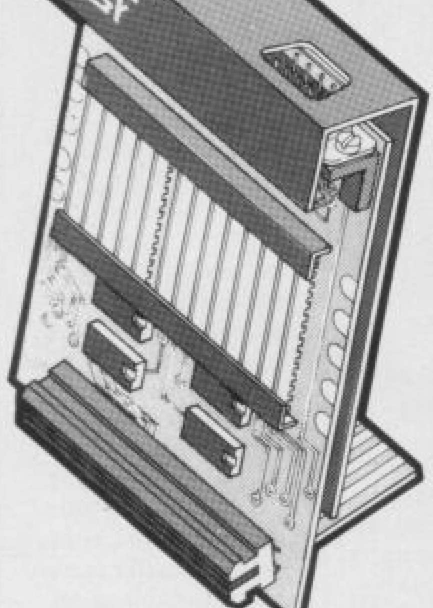
Camel's first release is the PROMER-SP, which allows the programming and checking of 8K and 16K EPROMs. Next up is the ROM-SP; this lets you load and run EPROMs from power-up, without making use of the Spectrum's own ROM. The last two devices are EPROM erasers — designated the DHOBI 1 and DHOBI 2, the latter also includes a tuner.

For the inside information, contact Camel Products; telephone 0223 314814.

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SUMMER MAIL ORDER ONLY SAVINGS

Programmable Interface



The AGF Programmable Joystick Interface has established itself over the past year as being the only hardware programmed device that accepts ALL standard joysticks or trackballs – including Quickshot II with 'rapid-fire' – for use with ALL Spectrum or ZX81 software.

The hardware programming method employed by this product has several advantages over similar interfaces that require extra tapes to be loaded or combinations of key presses and movements of the joystick to be made before each game, i.e

- Programming is *not* lost when power is disconnected between games.
- Eight directional control only requires setting of the four normal directions.
- Compatibility guaranteed with ALL key reading methods – machine code and BASIC.
- Several interfaces can be separately programmed for multi-player software.
- Low power four i.c. design allows more expansion.

The programming leads attached to the interface make contact with miniature crocodile clips that give oxidisation free connections every time, unlike plug and socket arrangements, and they don't work loose in constant use.

Keyboard operation is unaffected by this interface and it is guaranteed never to conflict with ANY other add-ons.

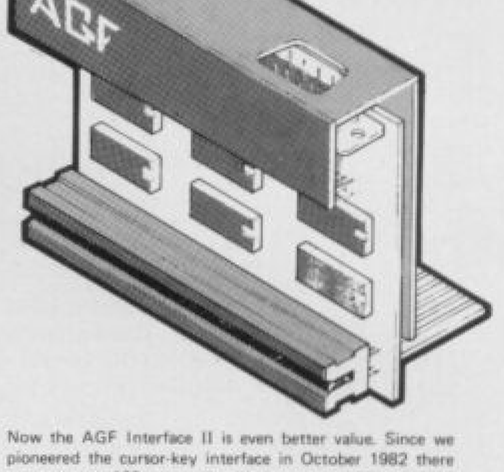
12 month guarantee, key programming chart and a pack of ten Quick Reference Programming cards with full instructions are supplied.

21.95

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Interface II

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Now the AGF Interface II is even better value. Since we pioneered the cursor-key interface in October 1982 there are now over 100 games or utility programs with either the AGF option or cursor key controlled – that makes it unbeatable at this new low price.

Still incorporating the all important rear expansion connector which means other peripherals can be connected at the same time i.e Ram Packs, Printers, Speech Units etc, and of course the key replication principle used guarantees this will never conflict electrically with any other add-ons.

NEW

RomSlot

The new AGF RomSlot has been designed for anyone who already owns a programmable joystick interface, or prefers to use the keyboard to control games, and would like to add the facility of ROM cartridge software to their system.

ROM games are already available from Sinclair and in August five totally new titles are to be released by Parker Video Games – exclusively in ROM format.

The advantages of this new system are instantly loading games that may have required a larger memory capacity if loaded by cassette. The ROM cartridge is actually a dedicated memory device with the program permanently stored in; ready for immediate use.

An extra feature of the AGF RomSlot is the 'Restart' facility. Any program can be instantly re-started or conventional machine code games cleared without the need to remove the power.

RomSlot is cased with a full expansion connector for other add-ons and is covered by a 12 month guarantee.

8.95

only ~~11.95~~ plus ~~50p~~ post & packing

7.50

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QL AFFAIRS

Presented by Leon Heller, *Acting Chairman of the Independent QL Users' Group (IQLUG).*

OPERATING WITH A DIFFERENCE

GST Computer Systems Ltd of Cambridge has announced 68K/OS, an operating system for the QL that appears to offer considerably more than the standard QDOS operating system provided with the machine. According to GST, Sinclair Research commissioned it in February 1983 to produce a new operating system for an OEM version of the QL. 'OEM' (Original Equipment Manufacturer) generally refers to a company that purchases something, then subsequently enhances it in some way for resale to an end user.

GST is negotiating with Sinclair Research for the rights to sell the QL as a single board computer (minus case, keyboard, Microdrives and power supply) with the 68K/OS operating system to OEMs who wish to use it for such application areas as computer aided design, terminal emulation, data acquisition, point of sale, etc. Features offered by 68K/OS include: single-user, multi-tasking; multiple screen windows; highly optimised disk filing system; device independent I/O; Unix-like 'pipes' for communication between programs; built-in menu and form handling; command or menu-driven 'shell'; integral graphics functions; and ROM resident (32K). Many of these features were in the original specification for the QL, but have since been left out of the machines that Sinclair Research is currently 'shipping'.

GST is negotiating too with several other software houses for the provision of the following languages: Basic, 'C', Pascal, Fortran 77 and MC68000 assembler. It's also planned to make available business software similar to the bundled Psion packages.

GST intends making 68K/OS available to QL users (no comment as to the likely cost), and has promised evaluation copies some time in August. These will take the form of a couple of EPROMs that replace those in the machine — with some additional code on a Microdrive cartridge.

It'll be interesting to see how 68K/OS fares against QDOS. Certainly, although punters will be forking out monies over and above the cost of the basic QL system, they'll get some very attractive features. It all boils down to how much it costs, and how long it takes for the additional programming languages to become available. It might be that 68K/OS will be bought by people who are writing QL software, which is then sold to the ordinary user to run under QDOS.

LIFE WITH THE LIONS

Software house, Joe The Lion continues to threaten us with the possibility of a Spectrum simulator for the QL. We're assured that the code to emulate Z80 operation on the MC68008 is working, and running as fast as a 4MHz Z80! The company is now designing the hardware to allow Spectrum cassettes to be loaded into the QL. Emulating the Z80 doesn't present too great a problem, but it's still impossible to believe it can be got running that fast. We'll all be delighted to be wrong.

LOOK WHAT I GOT!

If you want to see what version ROMs you have in your QL, just type PRINT VER$. If the machine responds 'AH', congratulations, you have the latest ROMs, which means that the operating system and SuperBASIC are essentially bug-free. 'PM' means that there are several bugs, and 'FB' indicates virtual infestation!

IQLUG is a non-profit making independent QL users' group. Further details on the organisation are available from: *Brian Pain, Acting Secretary, IQLUG, 24 Oxford Street, Stony Stratford, Milton Keynes, Bucks. Tel: 0908 564271.*

HEY BIG SPENDERS

Taking the bit firmly between its teeth, Sinclair Research is going on the offensive with an ad campaign — complete with TV coverage — worth over £4 million. The campaign is based on claims that the 41.5K of usable memory you get on the Spectrum is greater than computers costing up to three times as much. Another major incentive for purchasers will be the give-away 'goodies'.

Free with each 48K Spectrum will come the 'Spectrum Six Pack' — a software bundle worth £56.70 which features *Chequered Flag, Scrabble, Survival, Chess, Make-a-Chip* and *Horace Goes Skiing.* You'll also be able to buy an 'Expansion System' package for £99.95 giving you proud possession of a ZX Microdrive, the Interface 1 unit and a wallet of four Microdrive cartridges; these contain *Tasman II, Masterfile, 3D Ant Attack, Games Designer,* and a number of Microdrive demonstration and utility programs.

For anyone at all sceptical of the Spectrum's future in the micro market, Sinclair Research has announced that it's doubling production. This, the company claims, will allow production to ramp up to over 200,000 units per month by the end of the year.

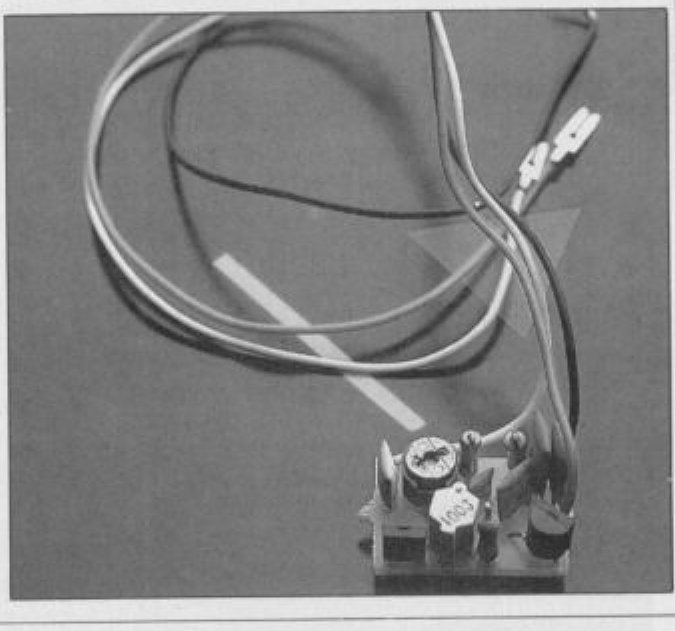
Announced too is the retail availability of both the QL and the flat-screen TV from September. Managing Director Nigel Searle says that "While production volumes for both are building up fast, we anticipate that demand will inevitably outstrip supply." Which presumably means that supplies in the shops may well be limited.

BETTER BEEPING

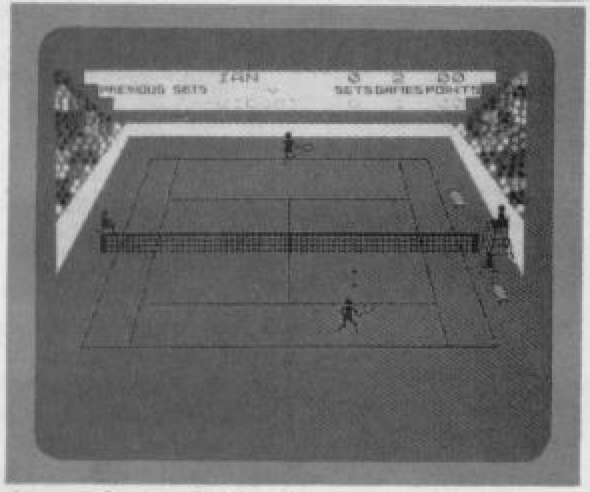
Compusound has produced a Telesound gizmo that allows beeps, keyboard clicks and so on, to be played through the loudspeaker of your television set; the device is so small, it fits easily inside the Spectrum's case. It also has the advantage of allowing (unintentionally) programs to be loaded or saved without unplugging leads.

Retailing at £9.95, Telesound is fitted by plugging the wires on to various parts of the internal circuitry as directed; this means that if ever your Spectrum needs to be repaired under guarantee, the unit can be removed — leaving no trace that it had ever been installed.

Anyone interested in one of these sound boosters should write to Compusound at 32-33 Langley Close, Redditch, Worcs; telephone enquiries on 0527 21429.



GAME, SET AND MATCH POINT



Anyone for tennis? Sinclair Research may have missed the Wimbledon deadline, but the game's well worth a look.

IAN McKINNELL

Well, the Wimbledon fortnight is long since past, but for those who just can't wait until next year, Sinclair Research has brought out a new tennis game called *Match Point*— to help you while away those long winter hours.

"You cannot be serious...", I hear you say! Yes, it's true. Menu options include a choice of one, three or five sets, playing human, versus human, human versus Spectrum or Spectrum playing itself in an exhibition match. Playing speed increases considerably as you proceed through the quarter-finals, semi-finals and finals, and all the rules of tennis are obeyed. Some nice touches in the game include ballboys running out to collect balls from the net, the crowd looking appreciatively from end to end as the ball is played, and the loser throwing down his racket and clasping hands to head!

The graphics are very good and the Spectrum plays a very good, tactical game — even at the lowest level; in the higher levels, it even manages to somehow anticipate where you're going to hit the ball.

Overall, this is an excellent and realistic simulation, just as much as it's a very playable game. Priced at £7.95, *Match Point* is available from all Spectrum games retailers.

CUT PRICE STORE

For all those who want reasonably priced mass storage, there's good news from Radofin — manufacturers of the Aquarius; it's just announced its new Spectrum compatible disk drive. Known as the Quick Disk, it should be available in the shops around the end of August for just £129.

The unit makes use of a 2.8-inch disk which is divided into 40 sectors of 1280 bytes, giving an overall capacity of 102K when formatted (51.2K × 2) or 144K (72K × 2). The DOS includes the usual CATalogue, COPY and ERASE commands.

THE ONE THAT GOT AWAY

Following our toolkit review of last month, a new one has been rushed to our attention. Supercode II is an updated version of the original Supercode *(Well, I never! Ed.)* from CP Software and it's sporting no fewer than 120 machine code routines.

Priced at £9.95, it's 100 per cent compatible with both Interface 1 and Microdrives.

FROM THE HIP



Troubleshootin' Pete Reporting . . .

This month's calls to TP have brought all sorts of questions and queries. First, let's turn to **John Samuels** of Cheadle, Cheshire. John wanted to know how far he could extend his Speccy's memory and where, for that matter, could he buy upgrades. Well — the Z80 processor can only actually address 64K directly, so if you take out 16K of that for the ROM that's already there, you're left with 48K RAM space — precisely the amount available in the 48K model.

But, I hear you cry, what about these 80K upgrades from East London Robotics we've all heard about? The simple answer is that those sort of upgrades don't address the whole 80K at one and the same time — they use banks of memory which can be switched in when needed. Personally, I don't see the reason behind the average person buying an 80K upgrade, unless you happen to write a lot of mega-long programs yourself. The only commercially available programs to use the full potential of the extra memory are those manufactured by the companies that produce the upgrades; and anyhow, it certainly won't make the computer any more powerful when running *Jet Set Willy*, for example.

Hot on the heels of the 75th call concerning the QL and all its versions (including FB, AH, JM, etc) **Dave Thompson** from Cardiff got on the line to ask if Spectrum software will run on the QL, and also whether the two networks are compatible. They're good questions. Joe the Lion of Liverpool claimed some time back that it had nearly finished a Speccy emulator and cassette interface that would allow you to run programs directly. Unfortunately, all attempted calls since then have been met only with the unobtainable tone; rumour has it the company's vanished down the Mersey Tunnel (perhaps they would like to contact us, if that's not the case).

You can, however, type in most Speccy programs and they should work after a little bit of straightforward conversion. But that's only Basic programs, of course, machine code is totally different. Networks between the machines are supposed to work too; the manuals and the adverts have always said they are compatible. But as yet, our own *Simon Goodwin* is the only person I know who's had any success with the Net, and that's only in one direction: from Speccy to QL, via an odd use of the COPY command which will be explained by Simon in a future issue — just as soon as he's worked out exactly what he did. Hopefully, this is another 'temporary fault' — to be corrected when Sinclair Research has finally come to some agreement with itself over which ROM it's going to use in the QL. For the present time, however, let's just call relationships between the two 'strained'.

Howard Robbins from Dorset reports having a pretty minor, but nevertheless annoying, problem with his 12-year-old son who's becoming very picky with dad's programs. When the screen prompts 'press any key to continue . . .', his son complains that when he presses the Shift keys the program won't continue — so you can't press *any* key at all. Short of changing the prompt to read 'press any key except the Shift keys to continue . . .', Howard has been stuck. Well Howard, here's the salvation you've been awaiting; lifted from Dilwyn Jones' book *Delving Deeper into your ZX Spectrum* (published by Interface Publications), this short routine should keep your son satisfied:

```
1000 PRINT "Press any key to
continue . . ."
1010 IF INKEY$="" AND IN
65278=255 AND IN 32766=255
THEN GOTO 1010
```

Of course, an even easier solution is wop him one round the ear and tell him to stop being so bl**din' pedantic.
Troubleshootin' Pete

Pete's phone lines are open from 10am-1pm and 2-5pm, on Wednesdays and Fridays. Ring him on 01-631 1433.

SPECCY STARS IN 'B' MOVIES

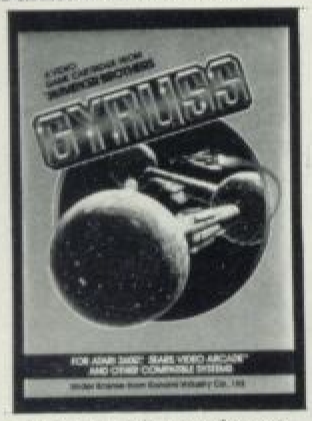
Company 'B', a London-based video company, has just completed a video presentation for Ebury Software. To get the perfect picture necessary for video recording, the company's Clive Gill spent some time looking into the Spectrum's video capabilities. The Ebury effort is the result of all this hard work — a picture which is better than you would expect to get from the Speccy at home on your colour telly.

Company 'B's connection with the Speccy doesn't stop there, however, because the outfit's been using a Spectrum for some time anyway — long before being approached by Ebury. It's got an electronic clapperboard and an electronic countdown à la Speccy, both of which have been in action for a while now. And the fun doesn't stop there because as soon as an RS232 lead arrives the Spectrum will also be controlling the video rostrum.

Company 'B' is now considering advertising its new-found talent for producing Spectrum videos. If you're interested, contact Clive at Company 'B' on 01-437 9693 and he'll give you instructions on how to find them deep in the murky depths of Soho's Wardour Street.

ROM SOFTWARE AT LAST!

Parker, which some time ago announced plans for ROM software for the Speccy and Interface 2, has finally come up with some product. In fact, Parker is the first inde-



pendent software house to produce software for this format, and Sinclair Research has given the company plenty of support.

The games themselves (announced in *Frontlines*, issue 4) are of a very high quality; indeed, all offerings include superb graphics and sound. However, one stands out above the others ... *Gyruss*. It's a space arcade/action game that has its players piloting their spaceship through the solar system from Neptune towards Earth.

The promotion that's planned is impressive. A machine called a Comparitor will contain copies of all the games — by simple selection of a number, potential buyers will be able to play whatever they like right there and then.

The games themselves will become generally available by October — at a price still to be decided but which is rumoured to be around the £19.95 mark.

TOP TEN TURKEYS



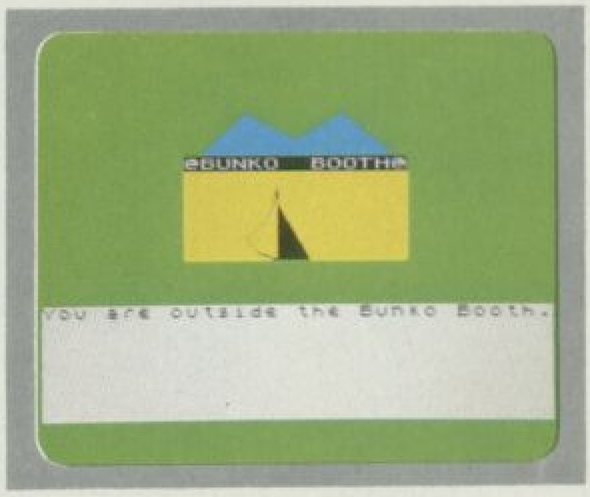
Hey it's Turkey time! And — surprise, surprise, it's *Jet Set Willy* in the pole position. Well, don't blame us, you voted for it! Votes for next month should be mailed post-haste (if not sooner); just use the coupon on the Top 20 page.

This Month	Last Month	Months In Chart	Title	Company
1	-	1	Jet Set Willy	Software Projects
2	1	2	Transylvanian Tower	Richard Shepard Software
3	-	1	Ah Diddums	Imagine Software
4	-	1	Hungry Horace	Melbourne House
5	-	1	Horace and the Spiders	Melbourne House
6	7	2	Mad Martha II	Mikro Gen
7	-	1	Planetoids	Psion
8	4	2	Yomp	Virgin Games
9	-	1	Hunchback	Ocean Software
10	-	1	Pedro	Imagine Software

PHOENIX DOUBLES UP

Phoenix Software has just launched a range of games for £6.99 that the company describes a 'steal'. Pinch 'em if you must, but basically each cassette contains two games — one arcade and one adventure; complete the arcade version, then flip over for the other.

Part one, *Joker's Wild*, has you stopping enemy aliens from capturing the souls of the human race with hypnotic cards. The *Dragon* adventure has you eliminating a corrupt Emperor — and clues and running code are locked inside a tiny sealed envelope marked 'Panic Packet — Only Open In Dire Emergency'.



A scene from the *Dragon* adventure game — for those in trouble, there's a 'cheat-sheet' provided.

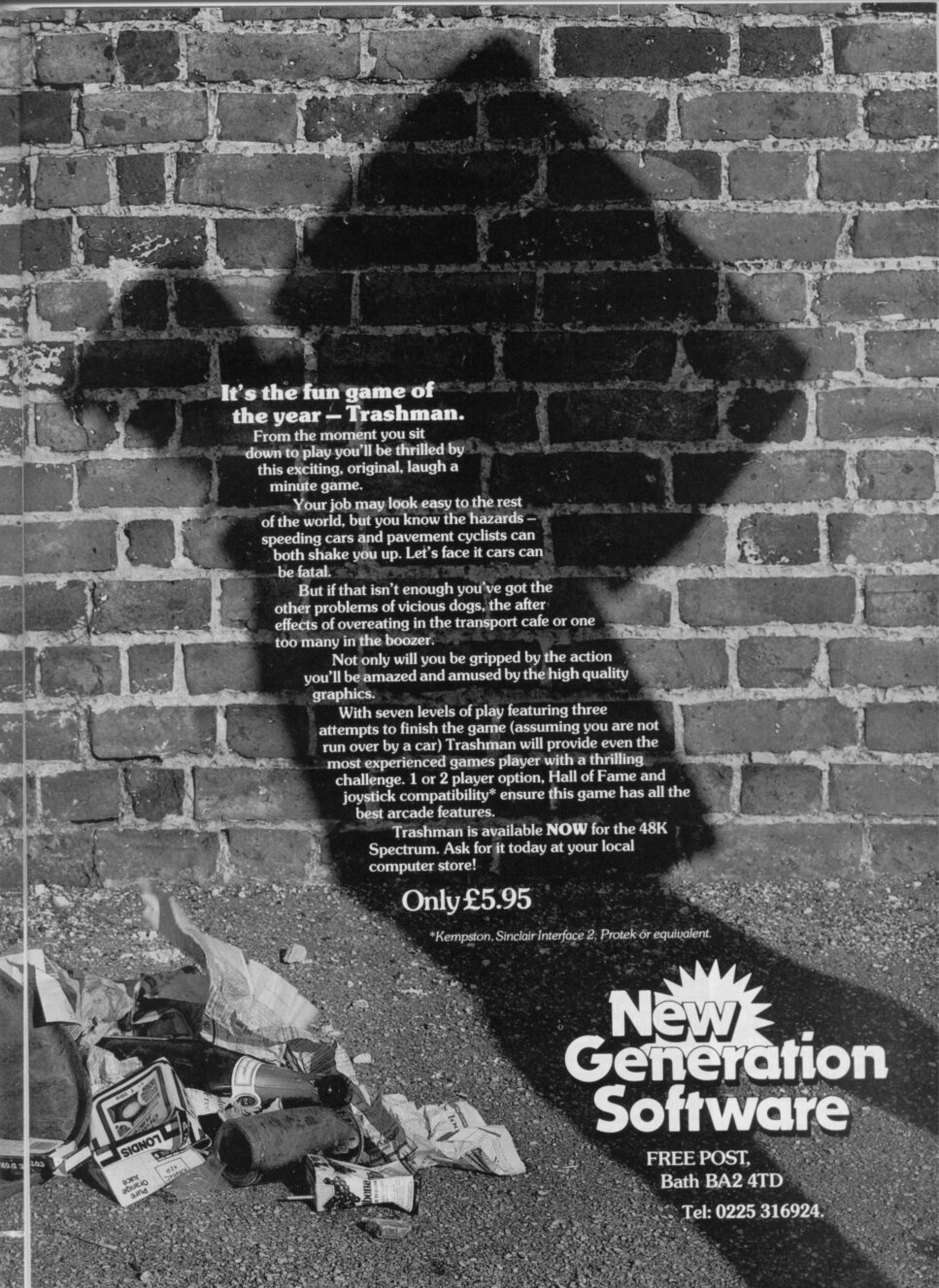
Both games will slot on to either a 16K or 48K Spectrum, and you'll find them at Boots and all good (not to mention, bad) computer stores.

SPIELS ON WHEELS

As part of WH Smiths' drive to train its sales teams in all aspects of computing, the company's now acquired two mobile classrooms which will tour the country. This project is the brainchild of Retail Staff Manager, Ken Newman; it occurred to him once that he realised it wasn't possible to send all staff to the training centre.

With these two new vehicles, it'll be possible for even part-time staff to be trained at or near their place of work. This is great news for people who dread going into shops on Saturdays, a time when usually no one is around to help with technical problems. The mobile classrooms will be on the road until October, and back again after Christmas. Who ever said that WH Smiths wouldn't take computers seriously?


Trashman
GSH
Guild of Software Houses
New Generation products are sold according to their terms of trade and conditions of sale.


It's the fun game of the year – Trashman.
From the moment you sit down to play you'll be thrilled by this exciting, original, laugh a minute game.
Your job may look easy to the rest of the world, but you know the hazards – speeding cars and pavement cyclists can both shake you up. Let's face it cars can be fatal.
But if that isn't enough you've got the other problems of vicious dogs, the after effects of overeating in the transport cafe or one too many in the boozer.
Not only will you be gripped by the action you'll be amazed and amused by the high quality graphics.
With seven levels of play featuring three attempts to finish the game (assuming you are not run over by a car) Trashman will provide even the most experienced games player with a thrilling challenge. 1 or 2 player option, Hall of Fame and joystick compatibility* ensure this game has all the best arcade features.
Trashman is available NOW for the 48K Spectrum. Ask for it today at your local computer store!
Only £5.95
*Kempston, Sinclair Interface 2, Protek or equivalent.
New Generation Software
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Tel: 0225 316924.

PHEW — WHAT A SCORCHER!

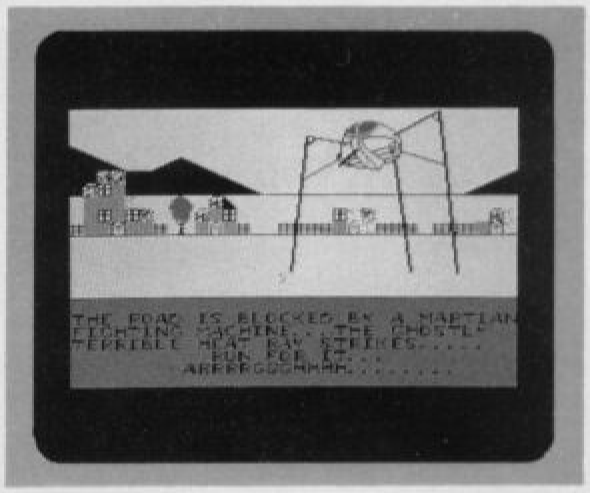
Some time back, Melbourne House published *Super Charge Your Spectrum* — in effect, a heady selection of ready-to-run machine code routines (multi-directional scrolls, useful sound effects, program re-numbering utilities and so on). Now from the same stable (and author) comes *Advanced Spectrum Machine Language,* a book containing far higher grade routines that cover areas of the 48K Spectrum that have never before been explored.

Right from the word go, author David Webb boasts things like animated loading screens, all you never knew about interrupts, the lowdown on pixel animation techniques, an interrupt-driven print processor with full screen horizon generator, and true Hi-res colour; all in all, pretty impressive for a mere book. And what's more, most of it *is* actually as good as it sounds; the only exception for me was that animated loading screens turned out to be the *Manic Miner* kind — as opposed to real animated characters that move across the screen while a program loads.

Several chapters of the book turn attention to the design and development of a sprite routine which is absolutely flicker-free. In fact, though this is probably the only part of the book to fall below the standard of the best arcade games; all the same, you still end up with a sprite routine worth having.

At times, David Webb tends to babble on a bit, but he always gets there in the end. Overall, *Advanced Spectrum Machine Language* is clear and well thought out, and it's also excellent reading for the most experienced of programmers. It's probably the best Speccy book of the year so far and, without doubt, receives the *YS* seal of approval.

Tony Samuels



When H G Wells wrote *War of the Worlds* somewhere back in the dark ages of 1898, you can bet he never expected it to end like this. Certainly, few such internationally famous books can claim to have made the transition from book to radio, then to film, TV, record and, finally, home computer. CRL has created a video game in conjunction with Jeff Wayne (whose best-selling *War of the Worlds* album was released in 1978); the software incorporates his music. The game is available for the 48K Spectrum at £7.95 from usual stockists, and CRL is planning versions for the CBM 64, Oric Atmos, BBC Micro, Electron and MSX machines to appear in the near future.

DK'S NEW FACE

Dk'Tronics new programmable joystick interface enables any software from any supplier to be used with joystick control. It can be programmed quickly and simply from the keyboard, or with the machine code software



supplied. Both joystick and keyboard can be used simultaneously and, in most cases, the joystick can even be programmed while the software is running. The port will accept any Atari-type joystick, and the interface is compatible with Interface 1 and Microdrives.

Incorporated in the design is a through connector that lets you bolt goodies like printers and so on into the back. The price is £22.95 and it should be in the shops now.

DOWN THE GARDEN PATH

Calling all Speccy owners who enjoy a spot of gardening. Here for your edification is the first ever computerised plant database, called (unoriginally) *Green Fingers.* With it you can easily dig out the data on the ideal plants to add bloom to your gardening requirements.

You can stalk around the package for up to five of 17 characteristics simultaneously — such variables as height, hardiness, sun, water and soil needs, pruning, month of flowering, colour and so on — as you rake around for the ideal plant. You can also weed out of the database, comprehensive details on over 350 flowers, shrubs and trees; Latin names, or even nick-names can be used in the search.

The cassette implants into 48K Spectrums and costs £8.95 mail order from Practical Software, 40 Worple Road, London SW19.

SINCLAIRWATCH

Hotfoot after publicity, Sir Clive Sinclair continues to try wooing the more unfriendly (honest?) of the micro mags — giving his own mini-impression of Walter Mondale on the Presidential trail. And who can say it isn't working? One worthy publication has already managed to print a full colour picture of Clive on the front cover — heralding an interview that answers such weighty questions as why you can't buy posters of the great man in high street shops. And I thought there was an Obscene Publications Act! Actually, it's rumoured that homes up and down the country are now displaying *his* holy image on walls and doors — only thing is, for some reason many of the pictures are covered with tiny holes.

Actually, apart from defacing pictures, there are, of course, other ways of venting annoyance. Rumour reaches us that some dissatisfied customers have taken to sending a brick in brown paper to Freepost, Camberley. Wonder if they'll get enough to build an extension?

Hands up all those who saw Sir Clive receiving the ultimate accolade of satirisation on the wickedly funny *Spitting Image* TV programme. The gist of it seemed to revolve around a product that takes 28 days to come — I can't imagine what it was all about.

Many were surprised to hear of Imagine's recent demise, following acute financial problems. One of the largest Spectrum software houses, it was always thought to be very successful, despite the constant rumour of non-payment of bills. The company certainly knew how to write and market good games — and also how to be extravagant. Declared assets are rumoured to include a BMW, Porsche and XR3, presumably acquired to help give the programmers an ego trip. Ex-director, Colin Stokes, is now probably very glad he got sacked earlier this year — following the phone tapping episode; he's currently working for *Jet Set Willy* company, Software Projects.

Doesn't Sinclair Research realise the only way it's likely to get Microdrive acceptance from a still suspicious public is by making the blank cartridges far more widely available. But, I hear you say, they're already widely available in the shops — at £4.95! For many potential punters I believe the price still remains an insurmountable stumbling block. Of course, Sinclair Research would reply that no way could they match normal audio cassette prices and still keep the beasts profitable — after all, we're talking about different orders of manufacture quality. But the fact is, Sinclair Research may just have to bite the bullet to a greater cause. It could be the only way the company will ever fully succeed with its controversial system of storage. By Guttersnipe.

RUMBLES

Software sleuth, *Ron Smith,* wrestles with the rumours from around the houses.



A new game aimed at unemployed, aspiring socialites is currently being worked on by that ever prolific ideas machine — Melbourne House. The aim will be to rise from the ranks of 'working class philistine' right up to the dizzy heights of sheer affluence, acquiring on the way the required boorish behaviour and other necessary trappings.

Entitled *Hampstead,* the game will begin with our unhappy specimen of Homo sapiens living in a grotty little flat on the wrong side of town. On the dole and with very little money, our working class hero starts to hanker after the good life; he's had enough of poverty. But how can he manage the transition from these humble beginnings to become a wealthy and successful resident of London's desirable garden suburb?

Well, a quick look at the various alternatives will soon rule out such a sordid course of action as actually getting a job. Instead, the correct move is to become — yes, you've guessed it — a 'poser'. This involves finding the right girl, buying the right sort of pet, talking the right kind of esoteric nonsense and generally doing anything else that might help him to become one of 'them'.

OK, YAH!

Unfortunately, being a slob, our social climber doesn't have a clue how to go about it. So it's going to be up to you — the player — to help and advise our unsophisticated, unrefined yobbo on the finer points of succeeding in his desire to live in Hampstead. If MH's programmers keep to their production schedules, you should get the opportunity to do just that sometime in October, for a mere £8.95.

Still proving elusive, however, is Melbourne's long awaited *Sherlock Holmes* adventure. Says publicity manager, Paula Byrne, "the official launch date is now the 11th of September, and copies should be in the shops soon afterwards". Elementary, my dear Paula.

PLAY IT AGAIN

A lot less 'bovver' than writing completely new programs is to convert existing ones to run on different machines — which is precisely what Salamander Software (or more precisely, Jeff Minter and Co) is doing at the moment.

Towards the end of last summer, Llamasoft released one of Minter's funniest arcade games for the CBM 64. Called *Hover Bovver,* the player starts off by 'pinching' his neighbour's Air-Mo so that he can cut the lawn (16 lawns actually). However, Jim (who owns the mower) isn't too happy about all this. In fact, so angry is he, that he decides to give chase around the hedges and flower beds. You retaliate by setting your dog, Rover, on to him.

At this point, things really start to get out of hand. In your hurry to escape the wrath of Jim, you accidentally mow down a few flower beds — which upsets the gardener enough for him to join the posse. And finally, as if all that weren't enough, Rover gets a bit bolshy about the noise and starts biting at the mower; the stupid animal receives a short-back-and-sides, runs off yelping and meanwhile, the Air-Mo overheats. Phew!

Anyway, friend Minter is well into the conversion (claims Salamander's Chris Holland) and the finished program should be available for the Spectrum in good time for Christmas. There's no information on price as yet.

WHO DONE IT?

Bringing us firmly back to earth in the role of a private detective, *The Dan Diamond Trilogy* is the latest project of Salamander Software. It's a collection of three text-only adventures based on Raymond Chandler's famous character, Sam Spade. As you progress through the game you'll uncover clues (along with a few red herrings) that should solve the case.

But what case? Says Peter Ohlson, "It's quite likely that you won't find out until the last adventure." — by which time, presumably, you'll have been shot at, stabbed, or at the very least beaten senseless for no apparent reason. To add to the atmosphere, appropriate sound effects have been included for when a gun is fired or when Sam runs out of oxygen (?). The whole trilogy comes complete for £14.95, and should be on the shelves by late August or early September. Help sheets will be available on request, for those who get stuck.

SPACE COWBOYS

If you've ever pictured yourself as a sort of helpful, cosmic Hell's Angel, then Softek's upcoming offering might be just what you're looking for. It's claimed that it'll be an interplanetary adventure where the player travels around on a motorbike without wheels. Well, who needs wheels in space?

Known as *Starbike,* the object will be to zoom over to a planet and pick up all the aliens (it's not clear yet whether they're to be rescued or 'alien-napped') and take them back to your space ship. But beware! If you return without having collected every last one of them, you'll be punished by losing one or more of your lives.

"*Starbike* will be available around the end of August," claims Softek's Martin Davis, "and will include not only adventure, but also strategy and shoot-em-up action as well." The price hasn't been finally nailed down, but it's expected to be in the usual £5.95-£6.95 range.

IT'S IN THE STARS

Strategy (and tactics) will both be included in a game which it's said will be the best of its kind when it's launched in October — according to a CP Software spokesman.

Called *Superchess 3.5,* "... it beats CDS's *Colossus 2.0* with no trouble at all. In fact, it wipes it out", claimed the man from CP. He also said that when *Superchess* played six games against *Colossus,* it won four and drew two. With *Colossus* being generally considered the current 'champion', a result like that just can't be ignored.

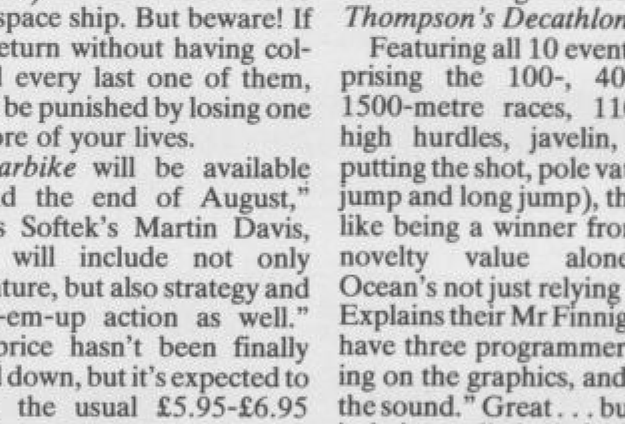
Another program being written by CP Software will be of particular interest to those concerned with astronomy, or perhaps even astrology, because it allows the user to look at the planets of our solar system in their correct positions at any given time. Just enter the date, and so on, and away you go. Watch this space for details

A SPORTING CHANCE

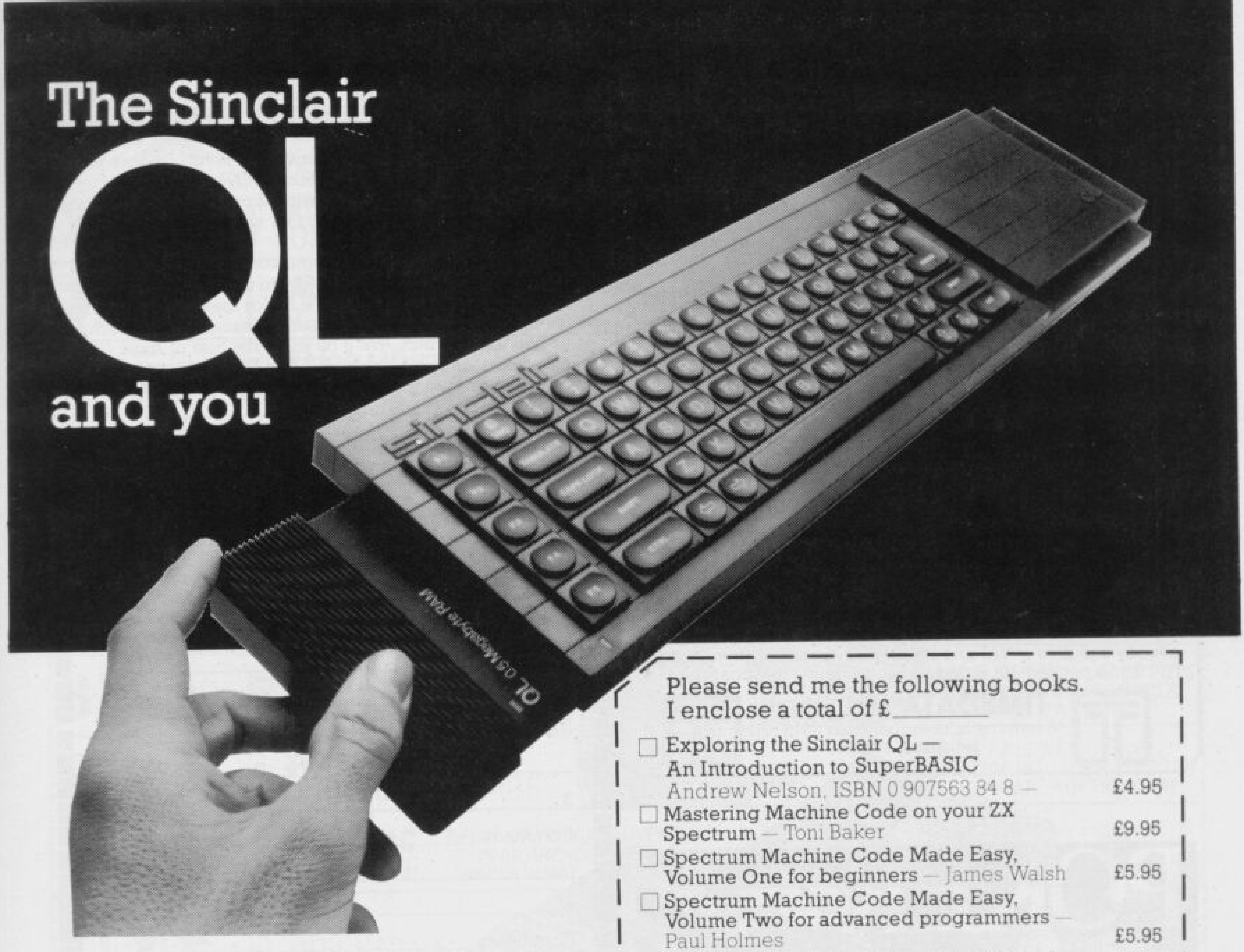
Olympic fever is currently afflicting both the management and staff of Manchester-based Ocean Software, as they work on something called *Daly Thompson's Decathlon.*

Featuring all 10 events (comprising the 100-, 400- and 1500-metre races, 110-metre high hurdles, javelin, discus, putting the shot, pole vault, high jump and long jump), this looks like being a winner from sheer novelty value alone. But Ocean's not just relying on that. Explains their Mr Finnigan, "we have three programmers working on the graphics, and one on the sound." Great... but why is it being called *Daly Thompson's Decathlon?* "Because a little black man is competing", says Finnigan. And also, presumably, because Thompson just happens to be the best in his field (ouch!).

There's no release date at the moment but it'll retail for £6.90, and be either keyboard or joystick compatible, with a two player option. YS



**As a result of signing a deal with the BBC, CRL is now working on a computer adaptation of the very popular Magic Roundabout animation, to be in the shops by around the end of August.
Says Andrew Stoddard, the game's author, "The game will be either keyboard or joystick compatible."**



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INTERFACE
PUBLICATIONS

— We're the experts! —

THE YS TOP 20

Welcome back to the chart that you know isn't fixed. As usual, not only do we have your top twenty fave-raves, we have your top-ten turkeys too (speaking alliteratively).

First polling slip out of the bag for this month came from Stephen Perry of Hemel Hempstead. Our usual prize of three new packages is on its way.

Don't forget, you can send in your vote every month, just fill in the form (or take a photocopy if you don't want to mutilate your magazine). By the way, you'll notice there's now room on the voting slip for you to put a personal comment next to each of your five top 20 votes. We'll be using the best of these (with name-checks) in our next chart.

Post all entries to YS Charts, Your Spectrum, 14 Rathbone Place, London W1P 1DE.

YS TOP 20 READER POLL

My top five raves on the Speccy are:

1 ____________________
Comments ____________________
____

2 ____________________
Comments ____________________
____

3 ____________________
Comments ____________________
____

4 ____________________
Comments ____________________
____

5 ____________________
Comments ____________________
____

My three top turkeys for the Speccy are:

1 ____________________
2 ____________________
3 ____________________

Name ____________________
Address ____________________
____
____
____

Postcode ____________________

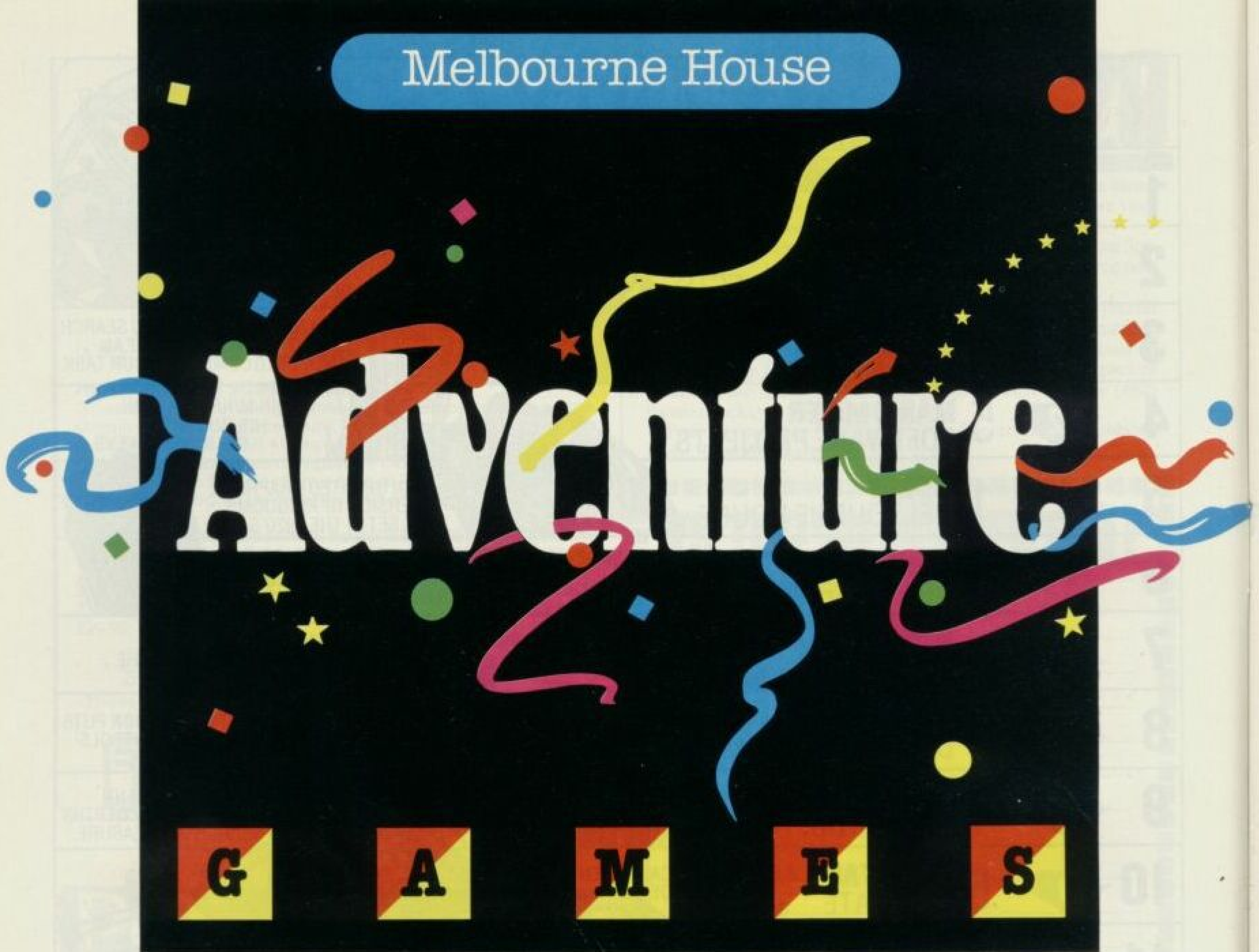
I understand that when this chart was tested — eight out of ten owners said their Spectrums preferred it. (*What? Ed.*)

**YS TOP TWENTY
YOUR SPECTRUM
14 RATHBONE PLACE
LONDON W1P 1DE**

YOUR SPECTRUM

YS TOP TWENTY CHART

THIS MONTH	LAST MONTH	MONTHS IN CHART	TITLE / PUBLISHER	DESCRIPTION
1	3	3	**LUNAR JETMAN** ULTIMATE	A COMPLEX ARCADE/ ADVENTURE THAT TAKES PLACE ON THE MOON
2	1	4	**JET SET WILLY** SOFTWARE PROJECTS	SEQUEL TO MANIC MINER. GO WITH WILLY TO 60 MORE EXCITING LOCATIONS.
3	NEW	1	**SABRE WULF** ULTIMATE	A MAZE GAME WHERE YOU SEARCH FOR THE FOUR PARTS OF AN AMULET TO COMPLETE YOUR TASK.
4	2	5	**MANIC MINER** SOFTWARE PROJECTS	JOIN MINER WILLY IN HIS QUEST FOR THE MISSING KEYS
5	NEW	1	**MUGSY** MELBOURNE HOUSE	AN UPDATED GRAPHICAL VERSION OF KINGDOMS SET IN THE 1920'S.
6	7	3	**TRASHMAN** NEW GENERATION SOFTWARE	TRY AND EMPTY THE DUSTBINS IN THE FASTEST POSSIBLE TIME, AVOIDING SNAPPING DOGS AND KILLER BICYCLES.
7	NEW	1	**WORLD CUP** ARTIC	LIFELIKE SIMULATION OF A FOOTBALL GAME ADDS TO THIS RECREATION OF THE WORLD CUP MATCHES.
8	10	5	**FIGHTER PILOT** DIGITAL INTEGRATION	A 3D FLIGHT SIMULATION PUTS YOU BEHIND THE CONTROLS OF A FIGHTER PLANE.
9	4	4	**SCUBA DRIVE** DURELL SOFTWARE	PUT ON YOUR WETSUIT AND PLUNGE INTO THE ICY DEPTHS IN SEARCH OF TREASURE.
10	9	5	**ATIC ATAC** ULTIMATE	A FULL GRAPHICAL ADVENTURE IN AN ARCADE GAME FORMAT
11	16	3	**FRED** QUICKSILVA	YOU TAKE THE ROLE OF AN ARCHAEOLOGIST LOOKING FOR TREASURE IN AN OLD MAZE-MINE.
12	NEW	4	**HUNCHBACK** OCEAN	A FAST MOVING ARCADE GAME WHERE YOU JUMP THE WALLS TO SAVE ESMERELDA.
13	11	5	**DEATHCHASE** MICROMEGA	'RETURN OF THE JEDI' LIVES! A SOFTWARE RECREATION OF THE EPIC 'ON YER BIKE' CHASE SCENE.
14	6	5	**ANT ATTACK** QUICKSILVA	AN AMAZING 3D ADVENTURE IN THE CITY OF ANTESCHER.
15	8	5	**CHEQUERED FLAG** PSION	JOIN THE GRAND PRIX CIRCUIT AND RACE ON SOME OF THE GREATEST TRACKS IN THE WORLD
16	5	5	**JET PAC** ULTIMATE	BUILD A SPACESHIP, THEN TREK THE GALAXY FOR RARE GEMS AND TREASURES.
17	NEW	3	**THE HOBBIT** MELBOURNE HOUSE	AN ADVENTURE BASED ON THE BOOK OF THE SAME NAME.
18	15	4	**CHUCKIE EGG** A&F SOFTWARE	FARMER GILES HAS TO ROUND UP ALL THE EGGS BEFORE THE NASTIES GET OUT AND EAT UP ALL THE CORN.
19	NEW	1	**LORDS OF MIDNIGHT** BEYOND SOFTWARE	A MULTI-SCREEN GRAPHICAL ARCADE GAME WHICH IS NEXT IN THE HOBBIT/ VALHALLA FAMILY TREE.
20	13	3	**WHEELIE** MICROSPHERE	A LIFE-OR-DEATH RACE AGAINST DOUBLE-DECKER BUSES AND MANIC HEDGEHOGS.



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MICRO ADVENTURER

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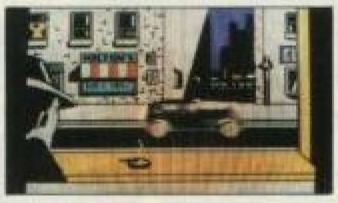
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PERSONAL COMPUTING TODAY

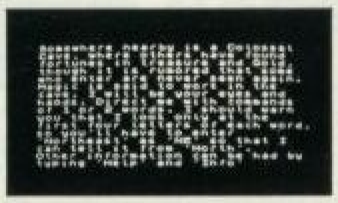
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YS9

FORUM

Is there something you're not telling us? Write to Forum, Your Spectrum, 14 Rathbone Place, London W1P 1DE.

KATAPILLA METAMORPHOSIS

With reference to your *Krazy Katapilla* program, may I be so bold as to indicate what I think are errors and general cock-ups in said program?

The Nudge facility cannot be used to complete (or even add to) the Katapilla — to cure, add line: 395 GOTO 860.
(*Actually it wasn't supposed to, but thanks for the tip. TP.*)
Also, you start with nine credits and still have a go left when the credit counters shows 000! To cure, change CRE in line 1710 to LET CRE=11 and also make line 110 read:

```
LET CRE=CRE-1: IF CRE=0 THEN
PRINT AT 15,23; PAPER 8;
"0":INPUT "NO CREDIT —
PRESS ENTER FOR MORE"; LINE
AS: LET CRE=10:GOTO 120.
```

This leaves the display ready to go when you run out of money. (*The original does start with ten credits — but credits are taken off before you go, hence the first display is of nine credits and the program shows 000 credits on your last spin. TP*).

Nudge is too infrequent (*I didn't want to make it too easy. TP*) — to cure this, change line 1630 to RND>.75. I also changed RND to>.6 in 1350. (*Well done! TP.*)

How about renumbering line 1210-1310 to 2-12, deleting 1210-1310, moving line 10 to 15, adding a line 1; GO TO 15 and changing GO SUB 1210 in lines 130, 340, 370, 400, 430, 460, 490, 1480, 1540, 1590 to GO SUB 2. This will marginally speed up the reels. (*Ha! TP.*)

I also changed three Bells to give a reward of £2, by altering the '100' in line 2040 to 200 and the first '£1' in line 3080 to £2. And I added a SAVE line — where's yours? (*It's not necessary to waste program space with a line that the program never calls itself. TP.*)

Just in case you're interested, I did all these changes, then attempted to renumber using BetaBasic; however, it failed — not taking old line 110!
Mr Harris, Billericay

Oh well, nothing wrong with a little customisation I suppose. Troubleshooting Pete.

UNZIPPING ZAPPED ZIP

I'd like to take this opportunity to clear up a few more points that have arisen out of the *ZIP* articles. I'm sorry to say that *YS* seem to have made a bit of a pig's ear out of another lot of listings. Perhaps this will sort things out.

In Listing 5, the total of the data is 7364. I've no idea where the figure of 7791 came from! The last four items of data are 'dummy' values not used by the code — hence they need not be POKEd (although they should be read if you want to end up with the total of 7364). The data lines were program generated — hence the overrun (which has no effect on the program) — at least that way they're correct! Lines 140 and 145 set up the 'vector' pointers which tell *ZIP* where to find the code for PLOT and DRAW. They aren't saved but, like most of Listing 5, they alter the library which *is* saved.

The 'calculation not allowed' error is a tricky one — it turns out that Listing 4 is at fault. For some arcane reason the listing was garbled. In the third column on page 65 you will find the explanation of line 7258, which "calls the MATHS routine twice, to process an X and Y co-ordinate".

Examination of the listing shows that *YS* child prodigy, Peter Shaw, re-typed the listing with only one call to MATHS, so that the Y co-ordinate is not scanned. Later *ZIP* finds a number when it is expecting to find a colon or end-of-line marker — the compiler assumes that you're trying to use an 'extra number' after PLOT or DRAW and retorts 'calculation not allowed'. The solution is to add an extra call to MATHS in line 7258, so that it starts....

```
7258 GO SUB MATHS: GO SUB
GETS: GO SUB MATHS: LET...
```

This fetches the X co-ordinate, the separator (a comma) and then the Y co-ordinate. If you've got the rest right, *ZIP* should then work.

I'm sorry the information got so garbled... please accept my apologies.

Concerning the *ZIP* Compiler Offer, I also have to apologise to readers who received their copy late. The delay was caused by a postal dispute in London, which meant that letters took up to three weeks to reach our office. The dispute has now ended and deliveries are back to normal.
Simon Goodwin, Birmingham

MODIFICATION MADNESS

It was with great anticipation that I took home issue 4 and prepared to enter Andrew Pennell's *Dumps of Distinction* program, only to read — with mounting horror — that his routine "rules out the old Epsons (MX-type and assorted lookalikes)".

However, as the program was just what I'd been looking for, I had a crack at modifying the code for my clapped-out MX80. After altering the line feeds, changing the mode to double density bit image and using five bytes instead of three (needing some overlapping of bytes as the last byte of the first colour becomes the last byte of the next), a reasonable simulation was achieved.
Mad Milmps, Durham




```
               START  EQU  32350
                      ORG  START
CD005B                CALL 23296 ;SETUP ROUTINE
1801                  JR   BEGIN
                      END
                      ORG  START+6
               ESC    EQU  27
3E1B           BEGIN  LD   A,ESC
CD027F                CALL OUTCH
3E41                  LD   A,"A"
CD027F                CALL OUTCH
3E03                  LD   A,3
CD027F                CALL OUTCH ;SETUP SMALL LINE FEEDS
0E00                  LD   C,0;ZERO x COUNTER
3E1B           NLINE  LD   A,ESC
CD027F                CALL OUTCH
3E4C                  LD   A,"L"
CD027F                CALL OUTCH
3E70                  LD   A,112
CD027F                CALL OUTCH
3E03                  LD   A,3
CD027F                CALL OUTCH
               ;PUT IN DOUBLE DENSITY BIT IMAGE MODF
               ;AND SET n1 AND n2 FOR 5 * 176 RITS OF DATA
0600                  LD   B,0;ZERO y COUNTER
C5             NXY    PUSH BC
CDAA22                CALL £22AA ;HL= SCREEN MEMORY
47                    LD   B,A
04                    INC  B
3E01                  LD   A,1
0F             L1     RRCA
10FD                  DJNZ L1
A6                    AND  (HL);Z IF INK,NZ IF PAPER
08                    EX   AF,AF
7C                    LD   A,H
0F                    RRCA
0F                    RRCA
0F                    RRCA
E603                  AND  3
F658                  OR   £58
67                    LD   H,A;HL=ATTRIBUTE BYTE
46                    LD   B,(HL);B=ATTR
08                    EX   AF,AF
78                    LD   A,B;A=ATTR
2003                  JR   NZ,INK
0F                    RRCA ;IF PAPER THEN /8
0F                    RRCA
0F                    RRCA
E607           INK    AND  7 ;MASK OTHER BITS
```

```
21E17E              LD   HL,TABLE
87                  ADD  A,A
87                  ADD  A,A
5F                  LD   E,A
1600                LD   D,0
19                  ADD  HL,DE ;HL=DATA SPECIFIED COLOUR
0605                LD   B,5 ;NO OF BYTES PER PIXEL
7E          OUTLP   LD   A,(HL) ;READ BYTE
CD027F              CALL OUTCH ;SEND IT
23                  INC  HL
10F9                DJNZ OUTLP ;DO 5 BYTES
C1                  POP  BC ;RESTORE x & y
04                  INC  B
78                  LD   A,B
FEB0                CP   176
38C7                JR   C,NXY ;DO ALL 176 PIXELS
3E0D                LD   A,13 ;END OF LINE SO DO CR
CD027F              CALL OUTCH
3E0A                LD   A,10 ;AND A LINE FEED
CD027F              CALL OUTCH

0C                  INC  C
20A4                JR   NZ,NLINE ;DO ALL 256 x PIXELS
3E1B                LD   A,ESC ;RESET LINE FEED
CD027F              CALL OUTCH
3E41                LD   A,"A"
CD027F              CALL OUTCH
3E0C                LD   A,12
CD027F              CALL OUTCH
C9                  RET
            ;DATA TABLE FOR COLOURS
E0          TABLE   DEFB %11100000
E0                  DEFB %11100000
E0                  DEFB %11100000
E0                  DEFB %11100000
E0                  DEFB %11100000
80                  DEFB %10000000
E0                  DEFB %11100000
20                  DEFB %00100000
E0                  DEFB %11100000
60                  DEFB %01100000
60                  DEFB %01100000
20                  DEFB %00100000
00                  DEFB %00000000
C0                  DEFB %11000000
80                  DEFB %10000000
C0                  DEFB %11000000
00                  DEFB %00000000
40                  DEFB %01000000
A0                  DEFB %10100000
40                  DEFB %01000000
00                  DEFB %00000000
40                  DEFB %01000000
40                  DEFB %01000000
00                  DEFB %00000000
00                  DEFB %00000000
40                  DEFB %01000000
00                  DEFB %00000000
00                  DEFB %00000000
00                  DEFB %00000000
00                  DEFB %00000000
00                  DEFB %00000000
00                  DEFB %00000000
            ;OUTCH SEND BYTE TO PRINTER
            OUTCH   EQU  $
            ;HILDERBAY OUTPUT
C5                  PUSH BC
E5                  PUSH HL
CDFE5B              CALL 23550
E1                  POP  HL
C1                  POP  BC
C9                  RET
                    END
```

If you're the proud owner of a "clapped-out MX80", try the converted code from Mad Milmps of Durham to get Andy Pennell's Dumps of Distinction working.

WHAT THE LORD GIVETH...

I'm writing to give warm and emphatic support to the letter entitled 'Microdriving' — written by John Ashplant — which appeared on issue 5 of *YS*.

I too have spent a fortune on software. I too have no intention of making money by copying and selling pirated software; and I too wish to get the best advantage of my own paid-for possessions. I enjoy the facility of being able to run programs from my Microdrive, with all that this offers in the way of speed and compactness, and therefore I feel that the obstacles placed in my way are both frustrating and unacceptable — especially when one considers how easy it is to transfer from tape to tape using two tape recorders.

Any advice, procedures, software or hardware which will enable non-technical and law abiding users to transfer taped programs to Microdrives are, in my view anyway, much to be encouraged (like Tasman and Campbell). Otherwise one starts to wonder about the purpose of having a Microdrive in the first place.

Ian Ross, Renfrewshire

At least one company (Romantic Robot) are selling software which will allow users to copy commercial programs to Microdrive; it'll be interesting to note whether this will cause any programmers to hit the piracy bandwagon. I suspect the reason there is so little software currently on Microdrive is the cost of the cartridges and their duplication — until Sinclair Research reduce the price of the cartridges, Microdrive owners are likely to find themselves discriminated against. I've said it before and I'll say it again.... life isn't a line of cherries. Ed.

THOSE FLICKERING VALUES

Regarding the letter from Mike Minchin in the June issue which restates the well-known problem of the 'flickering' of the values returned from the keyboard input ports, here's one solution your readers may like to consider.

To divide a *binary* number by 32 we would move the point five places to the left — so the returned eight-bit binary number from the input port would then, in fact, consist of the three high bits (including the 'naughty' bit 6) as the integer and the five low values as the fraction. We can then subtract the integer. Multiply by 32 and we've a whole number again which, as it doesn't contain bit 6, doesn't flicker. The unpressed value is, of course, 31 (16+8+4+2+1) but we can then simply add 224 to give the original unpressed value of 255.

The following short program will, I think, prove the theory:

```
5 REM PRESS KEYS
QWERT
10 DEF FN f(X)=(X/32-
INT (X/32))*32
20 LET a=FN (IN
64510)+224
30 PRINT AT 0,0; a
40 GO TO 20
```

I hope the above ramblings may be of some interest and use to someone. May I take this chance to thank you for publishing the best magazine on the market.

Derek Hirst, Barnsley

You certainly may.... and we thank you for your suggestions. Ed.

JET SET LOONY

Seeing your article in issue 4 about *Jet Set Willy* I felt compelled to write to you about some locations you've missed out. The Gaping Pit seemed the most obvious one, though even I haven't visited it. Secondly, and more importantly, you omitted *three* major locations; here's how you get to them.

Wait on the bow till 11.45pm (Smith time), which may seem an awful long time to you swashbuckling Spectrummers. At that moment, a raft will get tossed up on a large wave and you must then jump on. It takes you to Crusoe Corner (a desert island to us landlubbers). Then you shin up a palm tree to arrive at Tree Tops — The Sequel, from which you catch the bird that travels up towards In The Clouds. From there you can control yourself all over the house (funny things happen when you try to enter the water or the Master Bedroom) and from that point, it should be possible to find The Gaping Pit (though I've not tried it myself). It also clobbers the 'Attic Attack' and makes it possible to go through baddies (fire puts you down where you are, so be careful) whereupon the bird disintegrates.

Robin Daines, Chester

Hey, he's right... but if you wait In The Clouds long enough you actually get attacked by a ball of fire coming in from the left that first frazzles Willy, then dumps him inside an ice volcano under Hades, and then — and then — and then — OK, clear off schmuck! Ed

DISAPPOINTED DUMPER

In *Dumps of Distinction* on page 55 of *YS*, issue 4, you give listings for the Hilderbay, Kempston and Kempston E interfaces. The trouble is I don't have these; could you please tell me what mods have to be done to get the listing to run with my Sinclair ZX Interface 1? By the way, this is the first time I have bought your mag and I like it. Keep up the good work.

NJ Ball, Sidcup

To get Dumps of Distinction working via Interface 1, add the following lines to the listing.

```
1000 DATA 207, 49, 24, 16,-1
1300 DATA 197, 229, 207, 30, 255,
193, 201,-1
```

For some reason my particular printer kept crashing in the middle of the dump. So, if you have a similar problem, I can only suggest you try a lower Baud rate. Andy Pennell. YS

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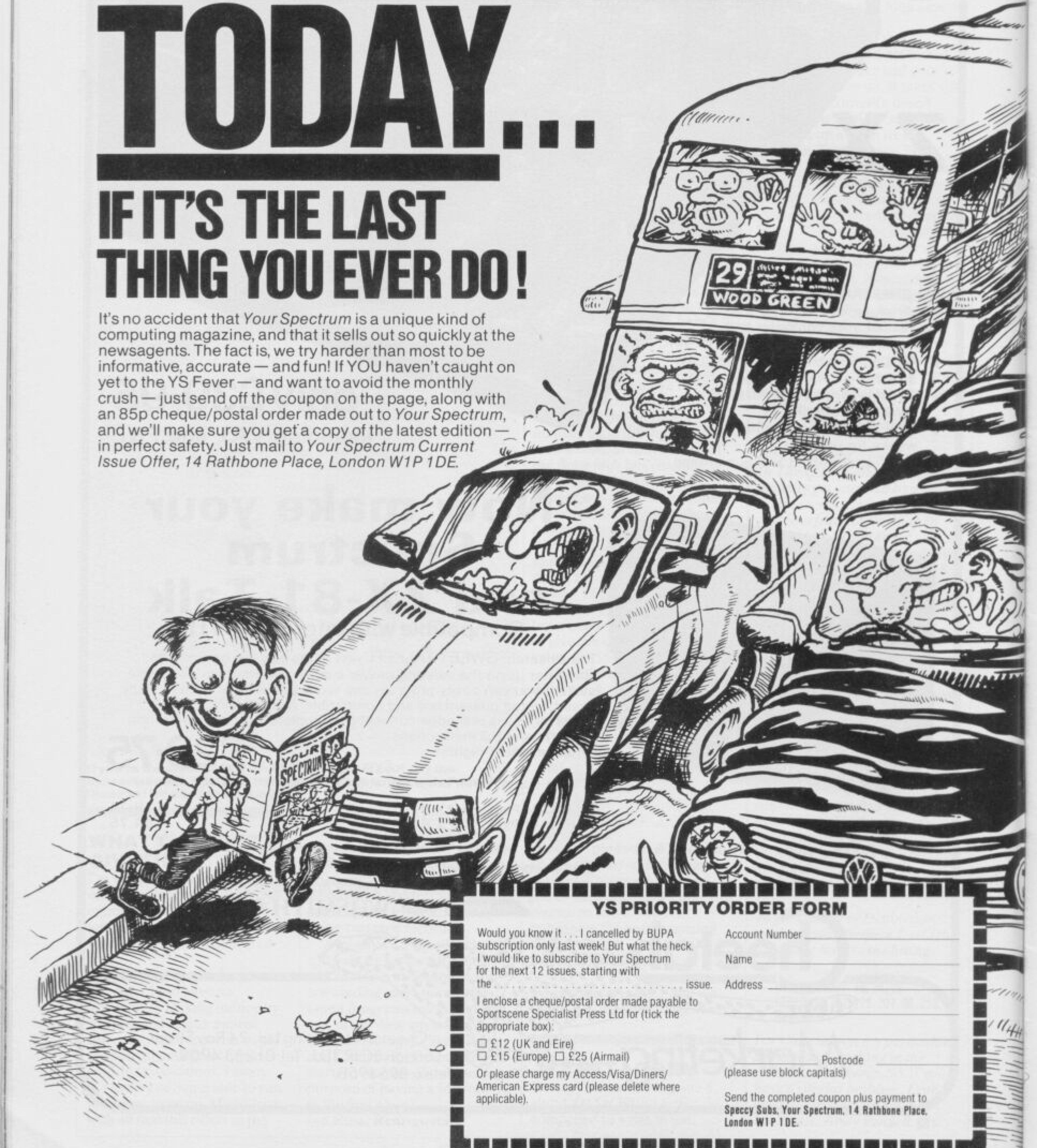
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SMOOTH MOVES

Does your Speccy output sometimes look like it's suffering from a bad case of the shakes? Relax . . . let things slide with* Simon Goodwin*'s cure for jerky graphics!

Presented here is a short machine code routine that lets you move graphics smoothly around the screen, without suffering the restrictions of the Spectrum character grid. Graphics and ASCII characters can be positioned at any high resolution co-ordinate with a simple Basic command. You're not restricted to the 704 'PRINT positions' — rows zero to 21 and columns zero to 31 — you can place characters at any point on the 256 by 176 Hi-res grid.

The program uses only 120 bytes of memory and is completely re-locatable, which means that you can load it anywhere in memory. It works without problems on a 16K computer. Another advantage over the usual PRINT AT command is that this one allows you to use an extra ninety-odd user-defined graphics. In addition to the usual 21 user-defined graphics (character codes 144-164), you can define and position characters 165 to 255 with the *YS Smooth Move* routine.

INTO LOAD MODE

The Basic listing loads the machine code into any area of memory. Type in the listing, taking care over the DATA statements, and then decide where you wish to store the code. On a 48K Spectrum you might want to put the code at address 64500. Type CLEAR 64499 to tell Basic that it must not use addresses above 64499, and then RUN the program. You'll be asked for a 'Load address' — enter 64500. The program reads the DATA and stores it from memory address 64500 onwards.

If you've made a typing error in the DATA, an appropriate message will appear. Correct the error and RUN again. Don't test the routine until the 'Position character . . .' message appears; the code is then ready for use. It's a good idea to SAVE everything, just in case an error has slipped past the 'check' in the loader.

On a 16K Spectrum (assuming you have no other machine code in memory) you might put the code at address 31670. Type CLEAR 31669 and then specify a 'Load address' of 31670. Of course, you can load the code anywhere you like, although it's best to protect it with the CLEAR command, or it could be overwritten by Basic.

The routine provides a Hi-res version of the command:

```
PRINT INK 8; PAPER 8; OVER 1;AT y;x;CHR$ c
```

The syntax is rather different:

```
RANDOMIZE x AND y =c +USR a
```

Where 'x' and 'y' are the horizontal and vertical co-ordinates of the top left corner of the character, 'c' is the ASCII code of the character and 'a' is the address where you stored the routine. So:

```
RANDOMIZE 0 AND 175=65 +USR 64500
```

will position a letter 'A' (character 65) at the top left corner of the screen — assuming you stored the machine code at address 64500. The RANDOMIZE is a 'dummy' to hold the result of the USR call. If your program uses random numbers you should replace RANDOMIZE with a dummy variable assignment, such as:

```
LET dummy=0 AND 175 =65 +USR 64500
```

You're allowed to specify coordinates or character codes with expressions as well as variables or numbers. For instance:

```
RANDOMIZE xpos+xdir AND ypos-ydir = CODE
"*"+USR move
```

is allowed. Our routine uses a neat technique to fetch the three previous expressions on the line, before the USR call. If there are more or less than three values, a 'Parameter' error will be reported. Make sure that you've used the correct separators — AND, equals and plus — between the co-ordinates, the character code and the USR call. If you're using calculations more complicated than addition, subtraction, multiplication and division, you may need to put each co-ordinate or character code in brackets — so that the routine can distinguish them.

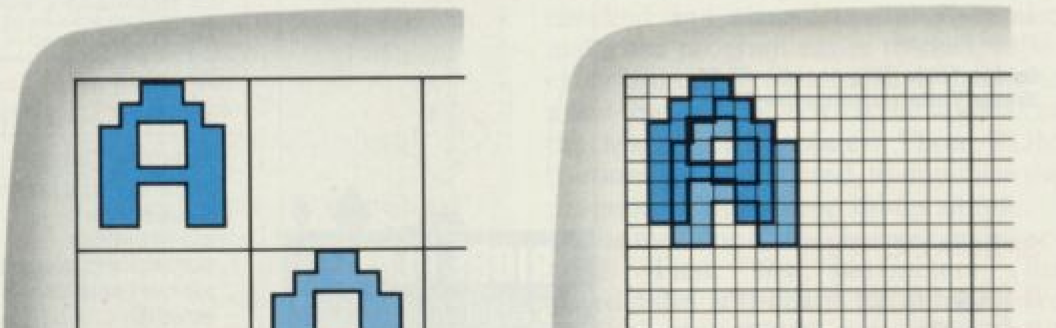
The machine code contains extensive error-trapping. It won't let you use y co-ordinates less than seven, since each character is eight lines high. A character at co-ordinate 0,6 would have its bottom line at y co-ordinate minus one! The 'Integer out of range' error message appears if you use vertical co-ordinates less than seven or greater than 175. Xco-ordinates beyond 248 simply 'wrap around' to the opposite side of the screen; decimal values are rounded to the nearest whole number.

A SMOOTH OPERATOR

The second Basic program shows the features of the routine quite clearly. A ball bounces around the screen at a variety of speeds. It's positioned using 'LET d=' rather than 'RANDOMIZE' so that the random number sequence is not constantly re-started whenever the ball moves. The listing is fairly straightforward, but make sure you type commas (not semicolons) in line 330.

The machine code always uses the OVER 1 setting, so that any character can be erased without destroying the background, simply by re-drawing it in the same place. The characters take on the colour of the INK where they are plotted. This avoids the need for compli-

PIXEL MOVEMENT



Using *Smooth Move*, you have the full 176 by 256 pixel grid within which to print your UDGs, 'special' UDG or the normal character set. The left-hand diagram shows character movement in one block jump; the illustration on the right shows how the character would make the same jump smoothly pixel by pixel in eight movements.

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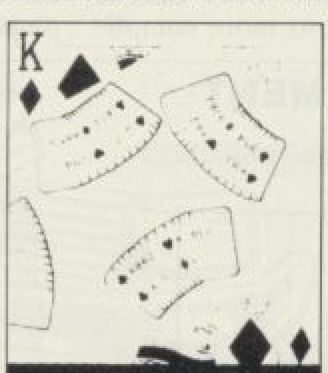
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SMOOTH MOVES

cated code to save and restore colours, and prevents weird effects as objects pass one another.

The Spectrum normally uses character codes 165 to 255 to represent keywords – words like THEN, PRINT and so on. There's never any need to zoom those around the screen, so our machine code program lets you define an extra 91 user-defined graphics in their place. Together with the 21 standard user-defined graphics, this gives you 122 characters to play with.

LABELS	ADDRESS	COMMENT
		SYSTEM POINTERS
UDGS	5C7B	User graphics pointer
CHARS	5C36	Character set pointer
BLKCH	5C92	Block graphic buffer
STACK	5C65	Maths stack end pointer
STBOT	5C63	Maths stack start pointer
		ROM ROUTINES
MAKEB	0B38	Make graphic in B
PIXEL	22AA	Find address of pixel
POP_A	2DA2	Pop A from maths stack

The table above shows the system pointers and ROM routines used in *Smooth Move*, giving their labels and addresses. This is for the assembler's use only, and need not be typed in.

The assembler code for *Smooth Move* — just so that you can see the interesting machine code tricks that Simon's used.

In principle the new characters are defined in exactly the same way as the old ones. They follow the others in memory, which means that you will have to expand the user-defined graphics area before you can define more than the standard 21 characters. On a 48K computer you'd use the following commands to expand the graphics area to cope with 122 characters:

CLEAR 64559 : POKE 23675,48 : POKE 23676, 252

The POKEs adjust the system variable CHARS so that it points an extra 728 (91 * 8) bytes further down memory. They don't reserve memory for any machine code, so you'd probably use CLEAR 64499 and load the *Smooth Move* code at 64500 (or thereabouts).

On a 16K computer load the machine code at 31670 and reserve space with:

CLEAR 31669 : POKE 23675,48 : POKE 23676, 124

When you come to program the user-defined graphics, you POKE the patterns into memory as usual. The only difference is that you can't use the USR "letter" function to locate characters after USR "u". The extra characters still follow at eight-byte intervals. User-defined graphic 'a' has character code 144, so you can find the definition of the character with code 'N' by typing:

PRINT USR "a" + 8 * (N—144)

TRICKS OF THE TRADE

Smooth Move uses some interesting machine code tricks, so I've listed the assembler code of the program as well as the Basic loader. This is the longest listing, assembled using version 2.1 of Picturesque's excellent *EDITAS* assembler.

```
FDE8             1320        ORG    65000
                 1330 ;             "Fetch end of stack"
FDE8 2A655C      1340 MOVER  LD     HL,(STACK)
FDEB E5          1350        PUSH   HL
                 1360 ;             "3 numbers on stack?"
FDEC EB          1370        EX     DE,HL
FDED 2A635C      1380        LD     HL,(STBOT)
FDF0 010F00      1390        LD     BC,15
FDF3 09          1400        ADD    HL,BC
FDF4 ED52        1410        SBC    HL,DE
FDF6 2802        1420        JR     Z,FCODE
                 1430 ;             "3 parameters needed!"
FDF8 CF          1440        RST    8
FDF9 19          1450        DEFB   25
                 1460 ;             "Find the char. code"
FDFA CDA22D      1470 FCODE  CALL   POP_A
                 1480 ;             "Divide into 3 groups:"
                 1490 ;             "  0-127 ASCII chars"
                 1500 ;             "128-143 block graphics"
                 1510 ;             "144-255 user defined"
FDFD FE80        1520        CP     128
FDFF 380B        1530        JR     C,ASCII
FE01 47          1540        LD     B,A
FE02 D690        1550        SUB    144
FE04 3813        1560        JR     C,BLOCK
                 1570 ;             "Must be a UDG"
FE06 ED5B7B5C    1580        LD     DE,(UDGS)
FE0A 1804        1590        JR     INDEX
                 1600 ;
FE0C ED5B365C    1610 ASCII  LD     DE,(CHARS)
                 1620 ;             "Find character form"
```

```
100 REM SMOOTH MOVE DEMO
110 REM By Simon N Goodwin
120 REM
130 REM Load code
140 CLEAR 30999
150 LOAD "Mover"CODE 31000
160 REM Set area
170 LET xmax=247
180 LET ymax=168
190 REM Set up positions
200 LET xpos=INT (RND*200)
210 LET ypos=175
220 LET xdir=INT (RND*6+1)
230 LET ydir=-INT (RND*5+1)
240 REM Define ball
250 RESTORE
260 FOR i=USR "a" TO USR "e"
270 READ d
280 POKE i,d
290 NEXT i
300 LET shape=144
310 INK 6: PAPER 2: BORDER 5
320 FOR i=0 TO 21
330 PRINT AT i,0, INVERSE 1,
350 NEXT i
360 GO TO 480
390 REM Move ball
400 LET oldx=xpos
410 LET oldy=ypos
420 LET xpos=xpos+xdir
425 IF xpos>1 THEN  IF xpos<xma
x THEN  GO TO 440
430 LET xpos=oldx: LET xdir=INT
(RND*7+1)*-SGN xdir
435 BEEP .03,15
440 LET ypos=ypos+ydir
445 IF ypos>7 THEN  IF ypos<yma
x+7 THEN  GO TO 460
450 LET ypos=oldy: LET ydir=INT
(RND*5+1)*-SGN ydir
455 BEEP .03,30
460 LET d=oldx AND oldy=shape+U
SR 31000
470 LET shape=shape+1-4*(shape=
147)
480 LET d=xpos AND ypos=shape+U
SR 31000
490 GO TO 400
590 REM Ball definition
600 DATA 60,66,135,143,143,159,
126,60
610 DATA 60,66,193,225,249,253,
126,60
620 DATA 60,126,249,241,241,225
,66,60
630 DATA 60,126,191,159,135,131
66,60
640 DATA 0
```

A demonstration program featuring a ball bouncing around the screen at a variety of speeds. (Make sure you type commas and not semicolons in line 330.)

The assembler listing starts with the definition of a few constants used later in the program. These are defined at the head of the listing so that they can be checked and altered easily. They also make the program easier to read, especially if it doesn't immediately spring to mind that, say, 5C65H is the address of the Maths stack pointer! Three ROM routines have been used, to minimise the program size and keep things simple.

The machine code is in three main sections. First, the parameters (the coordinates and character number) are checked, then the character definition is located, and finally the character is positioned on the screen. The parameter checking relies on the way the Spectrum evaluates expressions. In a simple sum like:

PRINT 2+3*4

the computer must work out the multiplication before it does the addition. This is because the correct answer is 14 (or 2+12), not 20 (5*4).

```
FE1Q 2600      1630 INDEX  LD    H,0
FE12 6F        1640        LD    L,A
FE13 29        1650        ADD   HL,HL
FE14 29        1660        ADD   HL,HL
FE15 29        1670        ADD   HL,HL
FE16 19        1680        ADD   HL,DE
FE17 1806      1690        JR    GFONT
               1700 ;
FE19 CD380B    1710 BLOCK  CALL  MAKEB
FE1C 21925C    1720        LD    HL,BLKCH
FE1F E5        1730 GFONT  PUSH  HL
FE20 DDE1      1740        POP   IX
               1750 ;            "Fetch Y coordinate"
FE22 CDA22D    1760        CALL  POP_A
FE25 67        1770        LD    H,A
               1780 ;            "Fetch X coordinate"
FE26 E5        1790        PUSH  HL
FE27 CDA22D    1800        CALL  POP_A
FE2A E1        1810        POP   HL
FE2B 6F        1820        LD    L,A
FE2C E5        1830        PUSH  HL
               1840 ;            "Process 8 screen lines"
FE2D 0E08      1850        LD    C,8
FE2F E1        1860 PLINE  POP   HL
               1870 ;            "Step up to next line"
FE30 25        1880        DEC   H
FE31 E5        1890        PUSH  HL
FE32 24        1900        INC   H
               1910 ;            "Convert coord in H,L"
               1920 ;            "to address in HL & A"
FE33 C5        1930        PUSH  BC
FE34 44        1940        LD    B,H
FE35 4D        1950        LD    C,L
FE36 CDAA22    1960        CALL  PIXEL
FE39 C1        1970        POP   BC
               1980 ;            "Copy bit offset to B"
FE3A 47        1990        LD    B,A
               2000 ;            "See if char is on grid"
FE3B AF        2010        XOR   A
FE3C B0        2020        OR    B
               2030 ;            "Read font anyway"
FE3D DD7E00    2040        LD    A,(IX+0)
               2050 ;            "Store NOW if on grid"
FE40 2811      2060        JR    Z,STORE
               2070 ;            "Generate 16 bit mask"
FE42 EB        2080        EX    DE,HL
FE43 2600      2090        LD    H,0
FE45 6F        2100        LD    L,A
               2110 ;            "Reverse shift count"
FE46 3E08      2120        LD    A,8
FE48 90        2130        SUB   B
FE49 47        2140        LD    B,A
FE4A 29        2150 SHIFT  ADD   HL,HL
FE4B 10FD      2160        DJNZ  SHIFT
               2170 ;            "Put mask in DE"
FE4D EB        2180        EX    DE,HL
               2190 ;            "Mix into the display"
FE4E 7E        2200        LD    A,(HL)
FE4F AA        2210        XOR   D
FE50 77        2220        LD    (HL),A
FE51 23        2230        INC   HL
FE52 7B        2240        LD    A,E
FE53 AE        2250 STORE  XOR   (HL)
FE54 77        2260        LD    (HL),A
               2270 ;            "Advance through font"
FE55 DD23      2280        INC   IX
               2290 ;            "Count one line done"
FE57 0D        2300        DEC   C
FE58 20D5      2310        JR    NZ,PLINE
               2320 ;            "Tidy stacks; n.b. BC=0"
FE5A E1        2330        POP   HL
FE5B E1        2340        POP   HL
FE5C 22655C    2350        LD    (STACK),HL
FE5F C9        2360        RET
               2370        END
```

SMOOTH MOVES

The *Smooth Move* code takes advantage of the way Basic works out the results of a calculation, by ensuring that the co-ordinates and character number have been worked out, but not combined together, as the USR call is performed. The three numbers are languishing on a 'maths stack' of temporary results during the USR call. The machine code can read the numbers which have been so helpfully made ready by Basic, and then put things tidy afterwards so that Basic can carry on once the USR call is over.

```
 100 REM SMOOTH MOVE LOADER
 110 REM By Simon N Goodwin
 120 REM
 200 INPUT "Load address";L
 210 LET c=0
 220 FOR i=L TO L+119
 230 READ d
 240 LET c=c+d
 250 POKE i,d
 260 NEXT i
 270 IF c<>13017 THEN  PRINT "Er
ror in DATA": STOP
 280 PRINT "Position character c
 AT x,y with"
 290 PRINT "RANDOMIZE x AND y =
c +USR ";l
 300 PRINT '"Save everything, ju
st in case..."
 310 SAVE "SMOOTH/BAS"
 320 SAVE "SMOOTH/COD"CODE L,120
 330 STOP
 400 DATA 42,101,92,229,235,42
 410 DATA 99,92,1,15,0,9
 420 DATA 237,82,40,2,207,25
 430 DATA 205,162,45,254,128,56
 440 DATA 11,71,214,144,56,19
 450 DATA 237,91,123,92,24,4
 460 DATA 237,91,54,92,38,0
 470 DATA 111,41,41,41,25,24
 480 DATA 6,205,56,11,33,146
 490 DATA 92,229,221,225,205,162
 500 DATA 45,103,229,205,162,45
 510 DATA 225,111,229,14,8,225
 520 DATA 37,229,36,197,68,77
 530 DATA 205,170,34,193,71,175
 540 DATA 176,221,126,0,40,17
 550 DATA 235,38,0,111,62,8
 560 DATA 144,71,41,16,253,235
 570 DATA 126,170,119,35,123,174
 580 DATA 119,221,35,13,32,213
 590 DATA 225,225,34,101,92,201
```

If you've not yet got hold of an assembler, here's a Basic loader program allowing you to load *Smooth Move*.

This gives us a convenient way of passing numbers from Basic to machine code, without the hassle of PEEKing and POKEing. We can ensure that temporary results are ready by our choice of separators between the co-ordinates. In the command:

RANDOMIZE x AND y = c + USR a

Basic *must* do the addition first, to get the correct answer — adding is always done before comparison (=) and comparisons are done before AND. This idea is explained on page 12 of the thin 'Introduction' manual which came with your Spectrum.

On the way through the expression, Basic works out any calculations needed to find X, Y and C, since those calculations should have a higher priority than the 'plus' at the end of the line.

If you want to use equals, AND, or other so-called 'logical operations' in

your calculation of x, y and c, you must put the relevant calculations in brackets, so that Basic will work the whole value out before it reaches the USR call. A list of priorities is on page 201 of the Spectrum manual. Logical operations have priority '2', '3', '4' or '5'.

Basic puts temporary results in an area called the 'maths stack'. Two system variables are used to mark the top and bottom of this area: each value stored within it takes up five bytes.

Line 1340-1450 of the assembler are used to check that the maths stack is 15 bytes long when the USR call is reached: this means that three values are ready. If the stack does not contain three values, the routine stops with a 'Parameter' error — this is generated by lines 1440 and 1450.

A CHARACTER STUDY

The ROM subroutine POP_A is used to read a number from the maths stack and into the A register. Lines 1470-1560 fetch the character code, which is the last thing calculated and hence at the 'top' of the stack. They test the code to decide whether the character is a block graphic, a user-defined graphic or an ASCII character. There's no definition of the block graphics in the ROM — those are generated as required by a routine called MAKEB, which puts the pattern specified by a code in the B register at address BLKCH.

In the case of ASCII or user-defined characters, the routine finds the appropriate start address from the system variables (UDGS points to the user-defined graphics and CHARS points to the ASCII symbols). The character code is multiplied by eight (since each definition takes eight bytes) and the location of the character is found by adding the start address to the resultant value. GFONT copies the address of the character definition into register IX, for safe-keeping.

POP_A is used twice more to fetch the y and x co-ordinates where the character is to be displayed. The loop from PLINE onwards puts the character into video memory, one line at a time. Register C is used to count the lines.

The program takes the co-ordinates of each line and uses a ROM call to find the address where that line should appear. The ROM subroutine named PIXEL takes x and y co-ordinates in registers C and B, returning with the address of the byte required in HL and the position within the byte in A. The character definition is fetched and shifted sideways if need be.

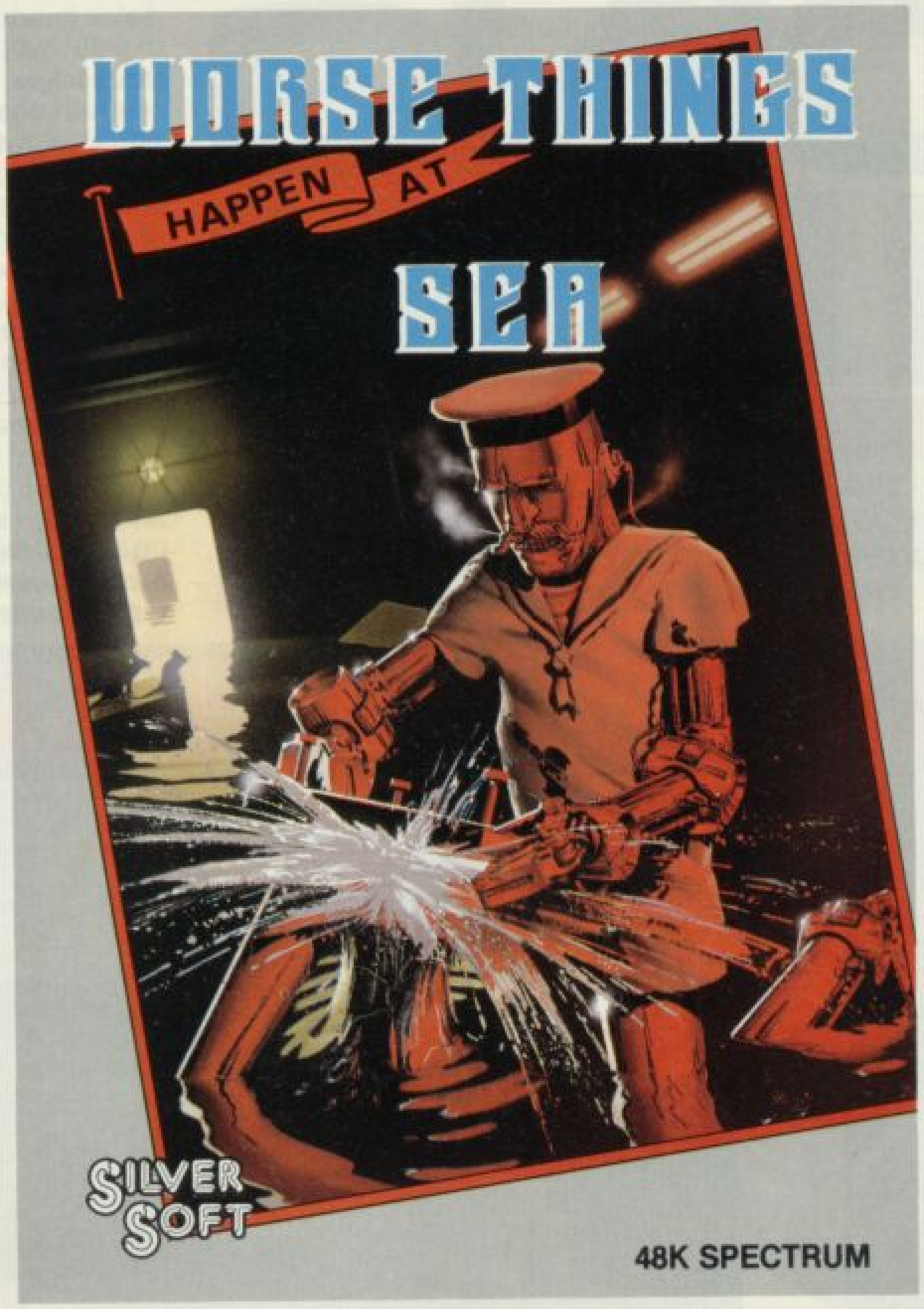
Each line of the Spectrum display corresponds to 32 bytes of video memory. The contents of that memory determines what's displayed on the line. The normal Spectrum PRINT routine uses one byte per character on each line, which means that characters cannot be printed partly in one byte and partly in the next. *Smooth Move* allows you to split characters between one byte and the next (hence the finer control over positioning). The character code is put into one end of the HL register pair, which is shifted sideways until it's at the required place on the boundary between H and L. The ADD HL,HL instruction is used to shift the value — every time you add a binary value to itself it moves one place to the left, because each column has twice the value of the one to its right.

At STORE the graphic line is mixed into the display with the XOR instruction — the machine code equivalent of PRINT OVER. The program loops back to PLINE until all eight lines of the character have been positioned.

TIDYING UP

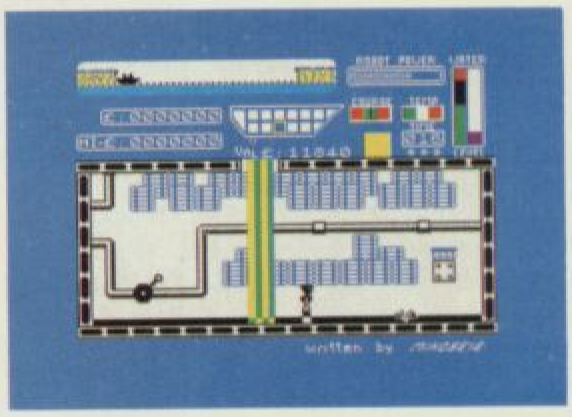
The routine can't return to Basic until both stacks — the processor stack and the maths stack — have been put back the way they were found. Line 2330 throws away the coordinate information which was on the processor stack. Finally, the value of the maths stack pointer is retrieved, so that Basic doesn't get confused by the sudden loss of three data items. The USR function returns the value zero, since B and C have both counted down to nothing.

This program is only an introduction to Hi-res animation on the Spectrum. The best graphic routines handle large shapes, with automatic animation and motion, collision detection, and so forth. One day I might divulge the secrets of the *YS Sprite System*, which puts most of the power of a dedicated arcade machine at your fingertips — that's if I ever finish writing it . . .! YS



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GOING OVER BOARDS

Feeling out of touch with your Spectrum? Then join Henry Budgett as he fingers his way through five replacement 'boards — all out to prove that pressing keys doesn't have to be a rubbery experience.

Ask a hundred owners of the Spectrum to point out their least favourite aspect of the machine and it's odds on that 99 per cent will plump for the keyboard as the prime culprit — which is hardly surprising, considering it feels not unlike a hunk of dead meat! Added to the peculiarities of its india-rubber action are the allied quirks of a non-standard spacing, a fiendishly complicated system of Shifts and Symbol Shifts to access the various keywords, and punctuation symbols littered everywhere.

While Sinclair Research's revolutionary keyword and syntax checking system works well enough for the beginner, it tends to stifle the familiarity that occurs on a more regular kind of computer keyboard. Remember, however much fast typing is simply not possible on a squidgy

Lo»Profile Keyboard

Price £49.95
Supplier Advanced Memory Systems, Woodside Technology Centre, Green Lane, Appleton, Warrington WA4 5NG.

The description 'Big, Black but Slim' might easily be misconstrued by some, but as dedicated readers of a computer magazine I'm sure you'll realise at once that I'm talking about the Lo>>Profile keyboard.

Internally, the keyboard can only accept the ZX Spectrum's main PCB — the various connectors hang out the back through slots, allowing you to add whatever's necessary. It comes supplied with a photocopy of an advertisement for the device — presumably to pass on to a friend — and a single sheet of instructions showing you how to fit it all together. Using logic, it's easy enough to assemble but nowhere does it mention that you've got to unplug the old keyboard, or that the Spectrum's PCB must go in the right way round.

Once fitted, at first sight it looks really nice, with a decent set of keys all properly laid out and a numeric pad set off to the right. All the legends are printed clearly on the keytops in the same colours as the original; the only one missing is Break — which ought to be on the Space bar, but isn't. The cursor keys are repeated on the numeric keyboard that features its own Caps Shift and '.' keys as well.

The casing is much wider than it needs to be — presumably designed on the premise that bigger looks better — and although the top is made of a substantial plastic, the base isn't and tends to 'give' under pressure. The keyboard surround is also rather flexible; it has provision for 11 mounting plates but only six were fitted.

Overall, the unit worked very well, but the initial feeling that it looked smart slowly evaporated once it had sat on the desk for an hour or two. But for those who hold great stead by personal appearances, the Lo>>Profile is definitely a 'looker'.

Lo»Profile Keyboard



The Lo Profile's keytop legends are printed clearly in the same colours as the original. Take care with the keyboard surround as this does seem rather flexible.

The cursor keys are repeated on the numeric keypad; also featured are a separate Caps Shift and '.' key as well.

The top of the case is constructed from substantial plastic; the bottom of the unit, however, isn't and tends to 'give' under pressure.

Some of the keyboard's keys are slightly bigger than on other units, for example the enter key; this is a feature 'stolen' from the larger personal computers.

FDS Keyboard

Price: £49.95
Supplier Fuller Micro Systems, The ZX Centre, 71 Dale Street, Liverpool 2.

A sleek, black plastic casing surrounds a contender that's really rather pleasant to look at. But the first obvious problem was a complete lack of any instructions — such is a reviewer's lot.

Still, inside the case I found two sets of possible mountings for the Spectrum's PCB — and as only one clears the keyboard, that was easy to solve. Unfortunately, only two of the four posts lined up with corresponding holes on the PCB — which is hardly good news from the mounting point of view. The power lead from the transformer has to go to the keyboard first, and a short lead from here connects to the PCB.

There appear to be mountings for the transformer but I suspect these might be best ignored for safety reasons. One of the two ribbon cables was damaged, a wire having broken off at the joint between the cable and the plug; both were rather short, making installation harder than it should have been.

The standard set of Spectrum keys have been added-to in an intelligent way, with a cluster of cursor keys, a full-size Space bar and a Shift key on each side of the keyboard. Also included are keys designated Rubout, f1, f2 and Sym — all labelled in bright red; the remainder are grey or black.

Once in operation I discovered the extra keys, f1 and f2, select the lower and upper keywords printed on the keytops — a neat idea and one which saves playing octaves across the keys to reach both Shift and Symbol Shift. The legends are screen-printed — which is one better than stick-on labels, but so badly done in some cases that it's a toss-up which is the least desirable method.

Overall, but for the quality of the finishing touches, I'd have to proclaim the FDS a pretty decent unit. Better keytop printing is a must and the

IAN McKINNELL

membrane, still there are several word-processing programs available!

Obviously, many of the major objections could be alleviated by the simple bolting-on of a full QWERTY keyboard that uses full-travel keys; this, however, is surely not the ideal answer. Many of the difficulties experienced by users trying to cope with the idiosyncratic shifting system could be solved through the addition of extra keys to handle the more commonly occuring characters — such as the punctuation and mathematical symbols, and the Delete key.

While carrying out such re-organisation, an astute designer can also build-in switches to control the power and isolate the EAR lead while recording. And further enhancements could include a case big enough to hold various

	Lo»Profile	Transform	dK'Tronics	Fuller FDS	Ricoll
Keyboard type	Mechanical	Mechanical	Mechanical	Mechanical	Mechanical
Action	Excellent	Good	Good	Good	Fair
Total keys	53	60	52	51	42
Numeric keypad	Yes	Yes	Yes	No	No
Cursor keypad	Yes	Yes	Yes	Yes	No
Function keys	No	Yes	No	Yes	No
Extra Shift keys	Yes	Yes	Yes	Yes	Yes
Full Space bar	Yes	Yes	No	Yes	Yes
Size (mm)	436×218×50	407×220×75	350×250×70	340×225×70	285×205×60
Weight (kg)	0.85	1.3	1.1	1.0	1.5
Case material	Plastic	Metal	Plastic	Plastic	Metal
Label method	Screenprint	Screenprint	Stick-on	Screenprint	Stick-on
MIC switch	No	No	No	No	No
Power unit inside	No	Yes	Yes	Yes	No
Power switch	No	Yes	No	No	No

installation of the PCB needs to be made much more secure. And, as usual, I still have serious reservations about installing the power supply unit inside the box.

Transform Keyboard

Price: £69.95
Supplier Transform Ltd, 41 Keats House, Porchester Mead, Beckenham, Kent.

This case has obviously been designed to look nice, and it certainly does — for almost £70, you'd have every right to expect something special.

Constructed from metal, the unit obviously presented its designers with the problem of isolating the Spectrum's PCB from its new case. Their solution was to request that you leave the bottom half of the computer's casing attached to the PCB — hardly the neatest of ways around the difficulty, but it does solve the problem. The power supply goes in too, and the whole thing (plus case) is stuck down with one of those double-sided pads.

Both a power switch and LED are provided but you'll have to be adept with a soldering iron to fit them; the instructions for fitting these extras are not at all clear. Another source of worry is the fact that the case isn't earthed; once again, you've got mains voltages hanging around, just waiting to bite you.

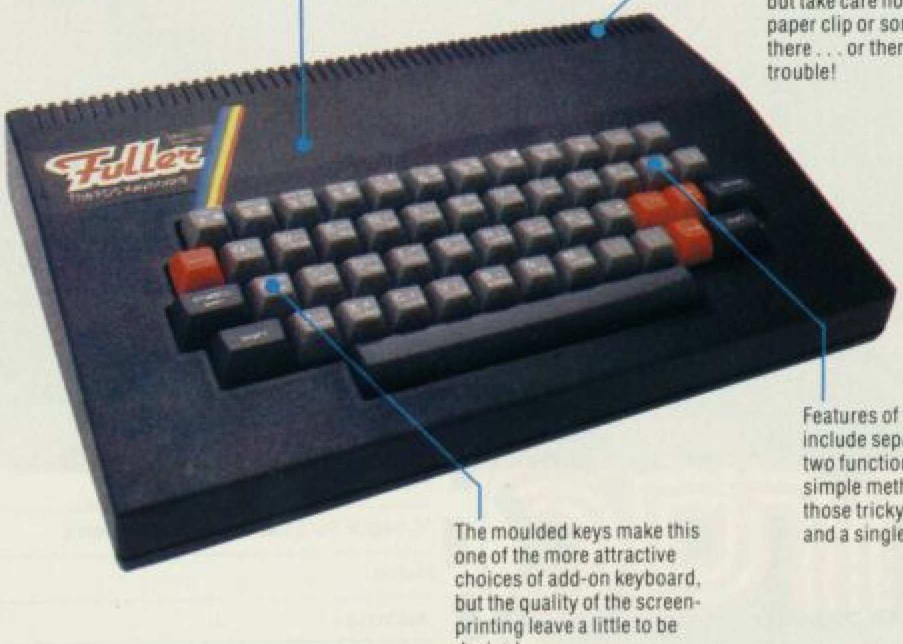
While the Ricoll unit is built of solid metal that's formed into a proper box, the Transform keyboard is flimsy by comparison. Littered with sharp-angled corners, it feels as if the slightest pressure could collapse it; with such little support, the board is prone to excessive flexing.

There are extra keyboard facilities on-board which include both Delete and Edit keys, as well as a full numeric keypad; once again, however, the Break function isn't labelled — but I'm sure you'll find it.

Transform Keyboard



FDS Keyboard



Dk'Tronics Cased Keyboard

Price: £45
Supplier Dk'Tronics, Unit 6, Shire Hill Industrial Estate, Saffron Walden, Essex CB11 3AQ

Definitely one for the DIY fanatic here! A really solid, black plastic case with a real key copy of the Spectrum's existing keyboard on the left and a 12-key numeric/editing keypad on the right.

The Spectrum's PCB fixes on to four plastic pillars, and for that you're expected to use the screws that came out of the computer — so don't lose any of them! The power supply will also fit inside the case, although

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GOING OVER BOARDS

components of the system . . . such as the power supply, Microdrive, Interface 1 and other add-ons. All these possible options have been considered while judging the five keyboards under test.

So, the question we're going to be asking ourselves is: just how far have the manufacturers gone towards creating the 'ideal' replacement? But there's a sting in the tail. Add a keyboard to your Spectrum and, although you're going to be enhancing its usefulness, you're going to raise its overall price to a level where you're justified in expecting something very special indeed. That's the high level of criteria to which the five units here have been subjected.

CONCLUSION

Just one of the keyboards on test comes close to meeting the exacting criteria I initially laid down for a replacement unit, and that's the Fuller FDS; even here the finishing touches let it down a bit. From a manufacture point of view, the best made by far was the product from Ricoll; given a set of decently engraved keytops, this would rate very highly as a direct replacement system — and it's also quite attractively priced.

Of the rest, the Lo>> Profile had most to offer but lacked the extra function keys of the Fuller model and could also do with more support for its keyboard. The Dk'Tronics unit needs to be supplied with the keys engraved or moulded — stick-on labels that the customer has to apply are not really sufficient. Otherwise it's a substantial add-on.

The Transform device seems to be a little over-priced for the facilities it has to offer over its cheaper rivals. Despite that it's recently been rated "top keyboard at the moment" by one of our magazine rivals; maybe you should check it out to see if I've missed an endearing quality or two.

On a final note, now that Sinclair Research has perfected the newer type of membrane — as used on the QL — it would be interesting to speculate whether the add-on companies are likely to make the switch too. It could be the key to success!

it has to be removed from its casing before you can install it. That means there's a healthy 240 volts floating just an inch or so away from the Spectrum PCB and keyboard. The manual points out that mains can kill — but even if nothing untoward happens, the mains hum will probably affect the picture quality.

The DIY element comes in when you find the sheet of self-adhesive stickers, to be used for labelling the blank keytops! The result is cheap, messy and unlikely to last as long as the legends painted on Uncle Sir Clive's original rubber squares. Insufficient support is provided for both the keyboard and keypad (which sag under pressure) but the key actions are quite nice.

That apart, if the keyboard came supplied with the keytops engraved or moulded, then I'd have to vote it a very reasonable product.

Ricoll Electronics RIKBI
Price: £37.95
Supplier Ricoll Electronics, 48 Southport Road, Ormskirk, Lancashire L39 1QR.

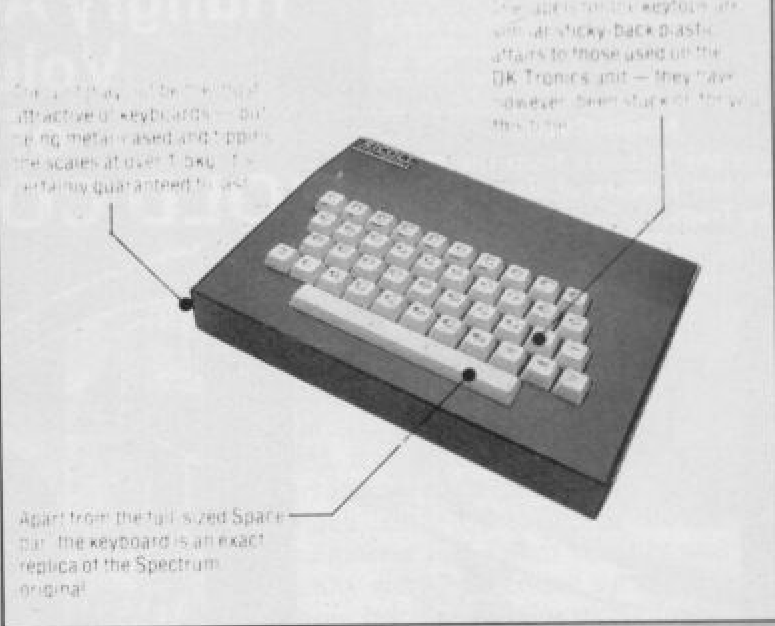
If you see sheer weight as a good judge of a product's quality, you're certain to be pleased with this one! Tipping the scales at a good old 1.5kg, this metal-cased keyboard seemed at first to be a solid prospect.

The system keyboard support proves better than that offered by many a rival and the main board stays firmly locked on to four metal studs mounted on the base. The 'manual' consists of two photocopied sheets, plus an extra note slipped in; this warns that one of the leads to the keyboard must be twisted, and that the user should beware of long component leads from the Spectrum's PCB shorting out on the metal base. Shudder!

Unfortunatey, apart from its full-size Space bar, the device is once again a real key copy of the original. But with no numeric keyboard added the unit is certainly compact and, being built of heavy gauge metal, it's virtually guaranteed to last. The same, however, cannot be said of the keyboard itself — it uses nasty little keytops that feature stick-on legends. Oh well, at least they've been stuck on for you!

This could have been a winner, had the quality of the keyboard matched up to that of the casing. As it is it's still a whole lot better than the Spectrum's rubber pads and very reasonable at the price.

Ricoll Electronics RIKBI



Dk'Tronics Cased Keyboard



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The Quill

48K Spectrum



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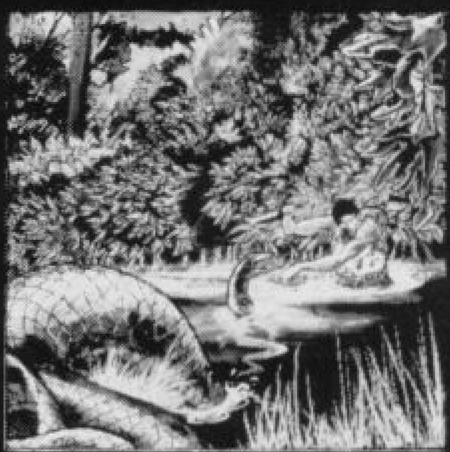
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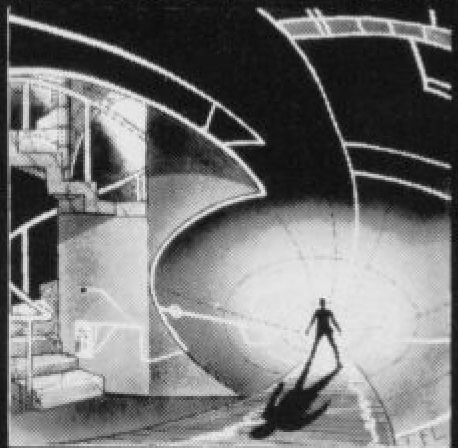
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SUDDENLY, IT'S THE 64K SPECTRUM!

Recent models of the ZX Spectrum have come supplied with 64K of internal memory, rather than the normal 48K. But, reports Simon Goodwin, the extra RAM is deliberately disabled so that you can't use it...

The latest version of our beloved Speccy, the Issue 3 Mark 5, can be distinguished by a letter 'v' printed on the circuit board after the issue number. Perhaps more noticeable is the revised board layout, which leaves the computer with only eight RAM chips fitted, rather than the 16 used in earlier versions of the 48K Spectrum. (Usual warning. Bear in mind that you could void your guarantee if Sinclair Research realises you've taken the computer apart.)

The original Spectrum design contained 16K bytes of memory, supplied in eight chips. Each chip contained 16K bits and, since there are eight bits in a byte, everything added up. The 48K version of the computer used another eight RAM chips to provide a further 32K bytes of memory. At first (on Issue 1 Spectrums) these additional chips were fitted on an extra plug-in board inside the computer. Later, a re-design ensured that the 32K chips could be fitted directly nto the main board.

CHEAP CHIP CHATTER

The snag — from Sinclair Research's point of view — was that 32K chips were expensive, and to understand this you need to know a little about the way RAM is manufactured. For various reasons, memory chips are made on square pieces of silicon. In principle each chip is just a matrix of memory cells and, since the matrix is square, a 'double-size' chip contains four times as many cells as a regular one — the size is doubled both vertically and horizontally.

When micros first became feasible, memory chips contained 1024 cells — 1K bits. Antique collectors among you may recall the '2102' chip — eight of these were needed to produce 1K byte, since there are eight bits in a byte. It wasn't long before 4K bit chips such as the 4007 and 2114 were available. Then everything got scaled up once again, and we were left with the 4116, the 16K bit chip which was — until recently — the industry standard.

Anyhow, the sequence of standard memory sizes goes directly from 16K to 64K, and it isn't easy to get hold of 32K components. One firm which created a demand for 32K RAMs was Tandy; it wanted to put 32K of memory into the eight sockets in its Colour Computer.

LOSING YOUR MEMORY

This is where things get complicated. Despite the square shape of chips the cells are usually arranged on the silicon in two rectangular groups of 8K, 32K or whatever. The chip industry has a very high failure rate, especially on new types of component, so many 64K chips were rejected because they were 'flawed' — some of the cells didn't work.

... You could even run the CP/M operating system on a Spectrum. That would upset a few manufacturers!

Tandy was able to test each half of the 64K chips separately, and sift out the ones which were half-working — hey presto, a 32K RAM chip. Meanwhile, in the UK, Dragon Data had to put up with double the amount of soldering and the extra circuit-space needed to provide 32K of memory in two 16K lumps.

A similar situation must have faced Sinclair Research when the 48K Spectrum was designed. Rather than try to cram an extra 16 chips into the already-crowded computer, it chose to use eight 32K chips.

An alternative solution appears in the Acorn Electron, which uses four 64K bit chips and special hardware to read 32K bytes from them in two steps. This is cheap and simple, but it slows down the computer since each chip must be read twice to fetch a single byte.

NOT AN ISSUE

So the first three issues of the Spectrum used a combination of eight 16K chips and eight 32K ones. The latest machines depart from that combination, but Sinclair Research has been very quiet about the alteration.

There was a great fuss when an earlier change in the design of the computer meant that Issue 3 machines used a subtly different keyboard interface; a few programs which had worked on earlier computers ignored the keys of an Issue 3 machine. This change — minor though it was — attracted considerable flak and Sinclair Research became coy about subsequent alterations to the machine.

But the design didn't stay fixed, both for reasons of performance and — perhaps more crucially — economics. Code letters were added to the issue numbers, so that revisions could be recorded without disturbing the punters.

MARKED OUT

The first re-design was dubbed the Issue 3 Mark 4, and can be distinguished by the roman numerals 'iv' printed on the circuit board after the issue number. In this case the change involved is believed to be slight, and essentially only of interest to repair-engineers. The next and — to the best of our knowledge — latest change has been rather more fundamental.

The issue 3 Mark 5 Spectrum contains just eight 64K memory chips. Improvements in the production of large memories had already forced other manufacturers to use full-blown 64K chips in 32K computers — one half was just left idle. The economics of this arrangement didn't upset the makers much, since the price of all the large memories had fallen steadily and half-faulty chips had ended up at almost the same price as fully-working ones.

The need for an 'upgradeable' design had decreased since most users were buying 48K machines at once, rather than purchasing the 16K model and upgrading it to 48K later. At first the price difference between models was £50 — now it has fallen to £30, and the 48K computer is selling for roughly the original price of the 16K machine. It also now sells about ten times as well as the 16K version.

The two-stage memory design was costly. It was intended to allow dealers to plug in an extra 32K, but in fact it ends up creating extra assembly work — since Sinclair Research has to plug in the extra RAM before the machine can be sold. A new design was produced, using 64K chips throughout, with no facility to remove chips and move back down to 16K.

To leave room for the 16K ROM, Sinclair Research had to disable a quarter of each 64K chip. This still gave the usual 48K, but with half the previous number of components — simplifying the manufacture, reducing power-consumption and saving money. This means that some of us may have an extra 16K of RAM lurking in the depths of our 48K sand-

SUDDENLY, IT'S THE 64K SPECTRUM!

wich toasters. The snag is that you can't use the extra memory, even though it's powered up, tested and in full working order. There's apparently no difference in performance between a 48K Spectrum and a 64K Mark 5 machine.

POSTAL PROCESSING

The Spectrum uses a Z80 processor, which can only address — or control — 64K of memory directly. The computer contains 16K of vital ROM without which it would completely ignore the user, so we're only left with an absolute maximum of 48K. This 64K limit is rather like having a postman who can only remember house numbers of up to three digits — bad news if you live at number 1175, since your post ends up at number 175 (I once had a house in Birmingham where precisely this happened).

You can get around the problem by having a new postman who can handle longer numbers (that is, a new processor — such as the QL's 68008 — which can address 1024K). Alternatively, you could duplicate some addresses and teach the postman to choose between the duplicates, according to where he or she has been previously. In computers, this technique is called 'paging': it's used in the ZX81 add-on boards made by Memotech.

USING YOUR 64K

So far it may seem as if there are no real advantages in owning a Mark 5 Spectrum. This is true, unless you're interested in voiding your warranty and digging around inside the computer. Hardware modifications will certainly be needed to bring the extra 16K under software control, but they'll be quite simple — certainly less complicated than the 'SoftROM' project presented in issue 2 of *YS*. That design allowed users to change the contents of the ROM area by putting 16K of RAM in its place; perhaps Mike Lord will come up with a revised project for Mark 5 Spectrum owners?

Once you've got your extra RAM under software control, the possibilities are endless. The extra space can be used for machine code or other languages (so long as you don't destroy crucial information such as the font, and the code used to handle the keyboard and display). You could just use the memory to correct the bugs in the Spectrum ROM, or as a neat way of patching in extra routines of your own. If you can re-locate the Spectrum screen display and re-write the device drivers (which handle the keys, display, printer and so on) — you could even run the CP/M operating system on a Spectrum. That would upset a few manufacturers!

Another approach would be to use paging to provide a choice between two 16K 'banks' of memory; an OUT instruction could be used to swop the banks. With care this would allow you to use 64K of RAM as well as the 16K ROM, but commercial software wouldn't use the facility and you'd have to adapt your own programs to select different banks as required. Your Spectrum would behave as if it had 16K ROM, 32K of normal RAM plus two 16K RAM lumps which used the same addresses and could only be accessed one at a time.

FURTHER IMPLICATIONS

There may be other reasons why Sinclair Research has kept quiet about the redesign of the Spectrum. It could be a sign that the 16K Spectrum will soon be discontinued — certainly the upgrade procedure from a 16K to 48K machine will have to change, since there'll be no room for the 16K chips once the 64K ones are fitted. It's also possible that the retail price of the Spectrum could be cut further, now that the new design is on the market. The production cost of a Spectrum should drop if only eight memories are used.

If you find any secret quirks of the Mark 5 Spectrum, *YS* would like to hear about it. And if you've just bought a Mark 6 machine... YS


fantasy
SOFTWARE
"Ziggy turned, his fingers clutching the trigger of his capsule gun, something had startled him or had it?
He looked back, he had grown very tired from his many exploits in THE PYRAMID negotiating 120 different chambers and coming face to face with some pretty nasty aliens.
No sooner than he had accomplished this mission, he was summoned by Time Lord Hamilton (known as Super Ham to his friends) to go to DOOMSDAY CASTLE and to save the Universe from the infinitely evil Scarthax, this being no small task took several megayears. By this time Ziggy was completely exhausted, his capsule battered, dented and wobbling as he limps in the direction of home, a real super hero of our time. Unable to leave the Universe undefended he radioed his great friend and colleague Beaky on the planet of Crackit to stand guard until his return.
Beaky would normally assume this role without a second thought, however he had his own problems to face for the dreaded Eggsnatchers had returned to threaten the very existence of his breed. Beaky's survival instincts do not allow him to leave Crackit until he has reared enough chicks to fight off the Eggsnatchers. In order to crack it, he must pass through 12 different stages each getting progressively harder.
So we have it, Ziggy returning home for a complete refit under the illusion that Beaky is defending the Universe, surely it can't take Beaky that long to secure his own species and when will Ziggy be back.....?"
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RAPSCALLION RAP

New from Bug-Byte and tipped for the top comes* Rapscallion *— a multi-screen graphic adventure.
Ross Holman *finds out whether it lives up to the claims of being "the next* Manic Miner*"...*

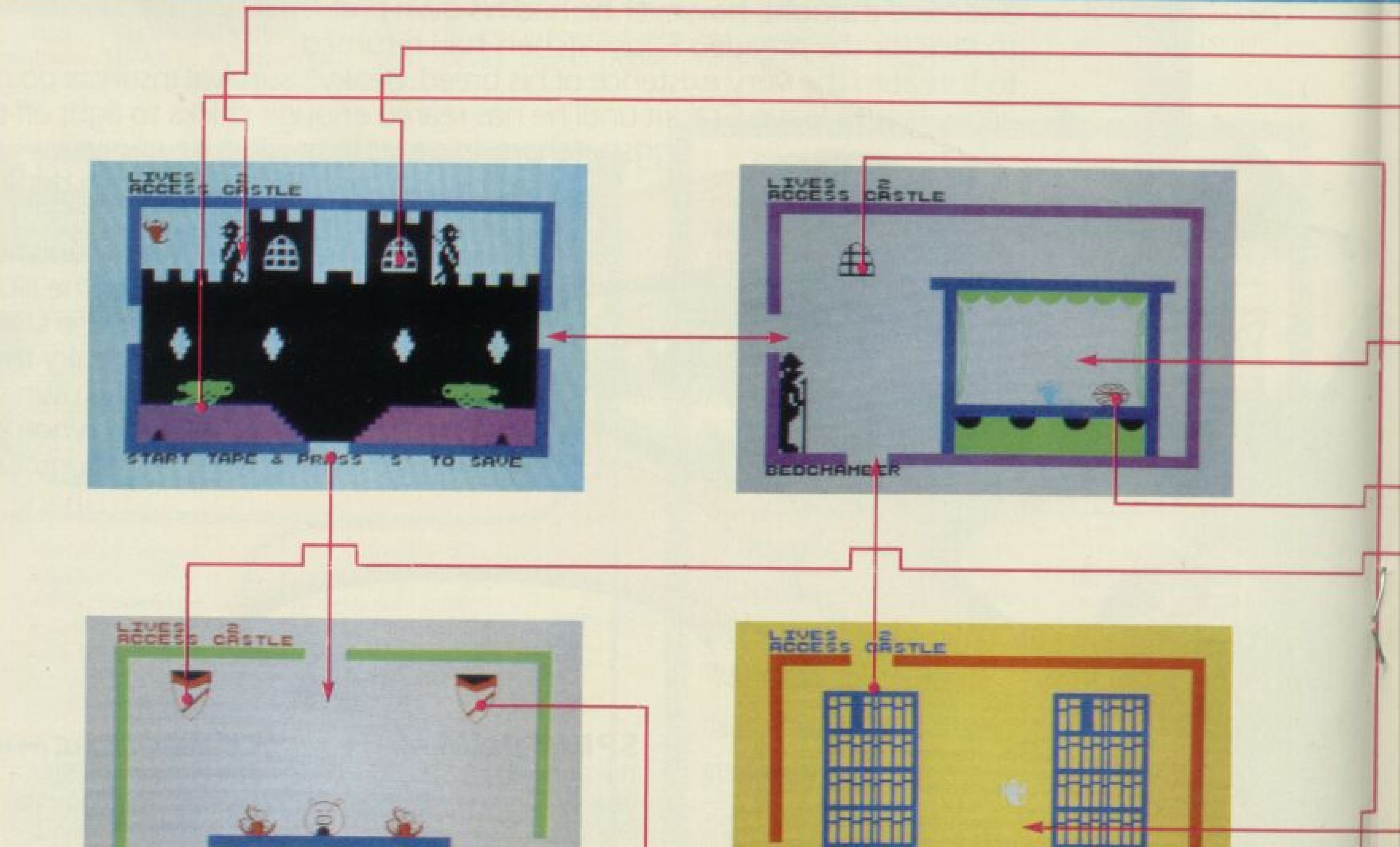
First impressions of games can easily be misleading, and this was certainly the case with *Rapscallion*. Described by Bug-Byte as a "fully animated cartoon adventure", you play the part of a usurped king who has had his crown and castle stolen by Rapscallion the Rogue — and as if this wasn't humiliation enough, he's then incarcerated in his own dungeon.

But help is at hand in the shape of a handy Fairy Princess. Not only does she set him free, she also turns him into a bird — giving him the ability to transform at will into a fly, while suffering only the loss of one of his six lives. Once in this bugged state you, the player, can control the character, moving around the forty-plus rooms of the castle (actually, I found 41 altogether) attempting to re-capture his rightful inheritance.

GRIPPING GRAPHICS?

The loading screen, now practically an art form for some companies, is not particularly gripping, but in its favour it does show some of the graphics used in the game. In fact, one unusual feature of much of the *Rapscallion* graphics is that they're drawn at half resolution — giving

THE THIRD DOMAIN-INSI



IAN McKINNELL

a similar chunky look as found on Commodore machines but without, of course, the multi-colour. It's hard to say whether this was done to create an individual style, or just used as a device to save memory; perhaps it was laziness! Anyway, after a long load, you're greeted by a page of instructions, followed by more and more. Sensibly, you have the option of skipping past them to the control options.

Wading through the instructions, you'll find all you need to know about the game. You discover there are three distinct sections, called The Wilderness, The Magic Labyrinth and finally, The Castle itself. To progress on to the next level, you need to complete a set task; for example, to leave The Wilderness, you have to collect the key to The Magic Labyrinth. Some rooms contain large diamonds which, when touched, impart useful information; others have pixies jumping up and down on toadstools, who generously give you gifts.

You're offered a comprehensive list of joystick options — additionally, there are two keyboard control layouts. A nice touch is that you can SAVE your current status at any time during a game, then LOAD it in again to continue from where it left off. The trouble then is if you carry on to complete the game, you're only going to get a lease rather than full freehold of The Castle. One thing, though — you're only given the option to LOAD the SAVEd details once; just before the first game. If you want to play from the same point again, you'll have to reLOAD the whole game, which is very tedious.

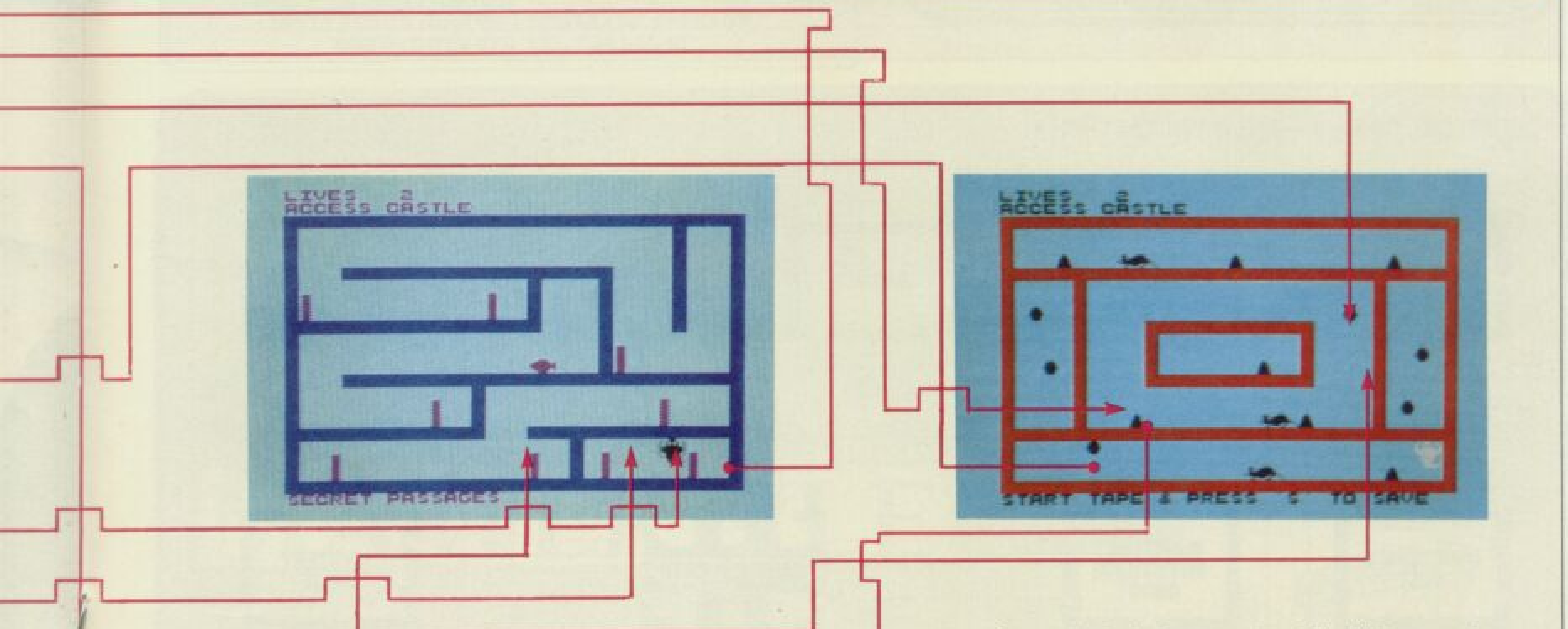
IN THE WILDERNESS

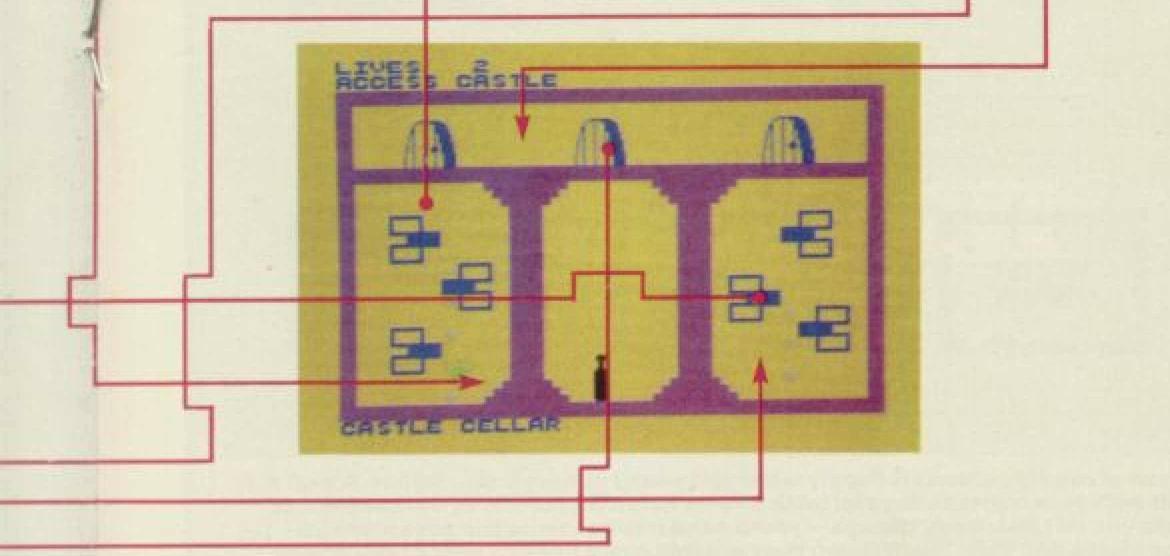
Off we go, and the first thing we see is the Dungeon, complete with skeleton and Rapscallion the Rogue placing the king in chains. Up comes the Fairy Princess who turns him into a bird and then buzzes off (to coin a phrase). At the top of the screen, there's an indicator of lives left, current sector, and any objects you've collected or powers you possess; at the bottom is the name of the current room. Moving around, you soon realise that all the graphics move by cursor block stages and any animation only takes place over two frames — which is rather disappointing. With many of the timing and manipulative skills removed, *Rapscallion* is no *Atic Atac* or *Jet Set Willy*; even so, interest is maintained by the degree of complexity and variation — not to mention the large, colourful graphics.

Each room contains a number of large fixed graphics and sometimes large moving graphics. Cats, for example, are six by six cursors, and smaller Hi-res graphics (spiders, for instance) are two by two cursors. Gaps in a room's border signify doors to other rooms. Most graphics are harmless and you can move through them without damage; some (usualy those falling from above) will slow you down ... touching flames or sparks will speed you up. There's subtlety too, because some graphics will kill or affect you, depending on the guise you're in at the time; for instance, cats kill the bird but not the fly — flies on the other hand, get trapped in spider's webs and the only way out is to transform into a bird, losing a life in the process.

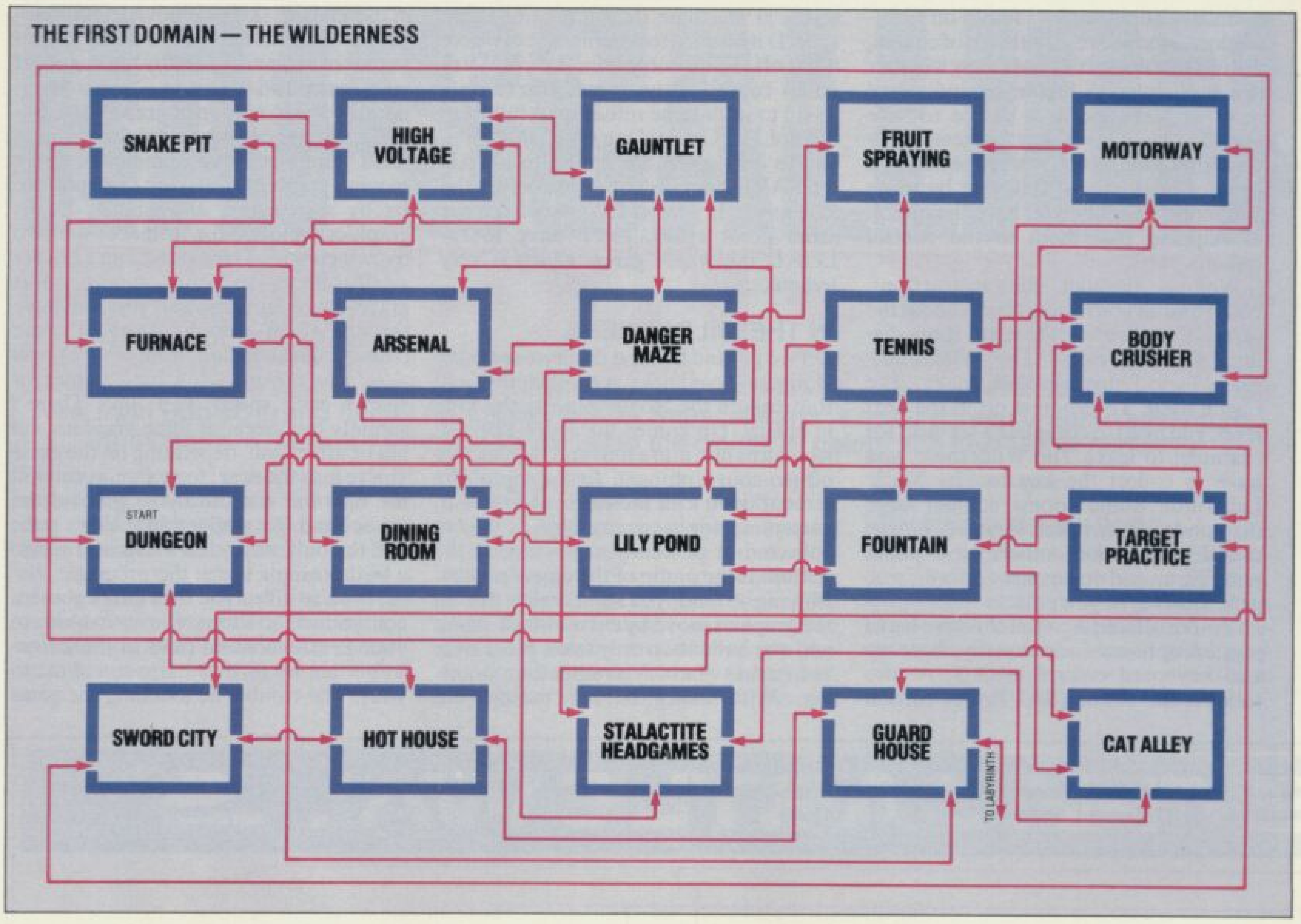
If you're killed you turn into a ghost, a condition that allows you to explore to your heart's content (and in the knowledge that no further harm can come to you). The trouble is, touching the gems

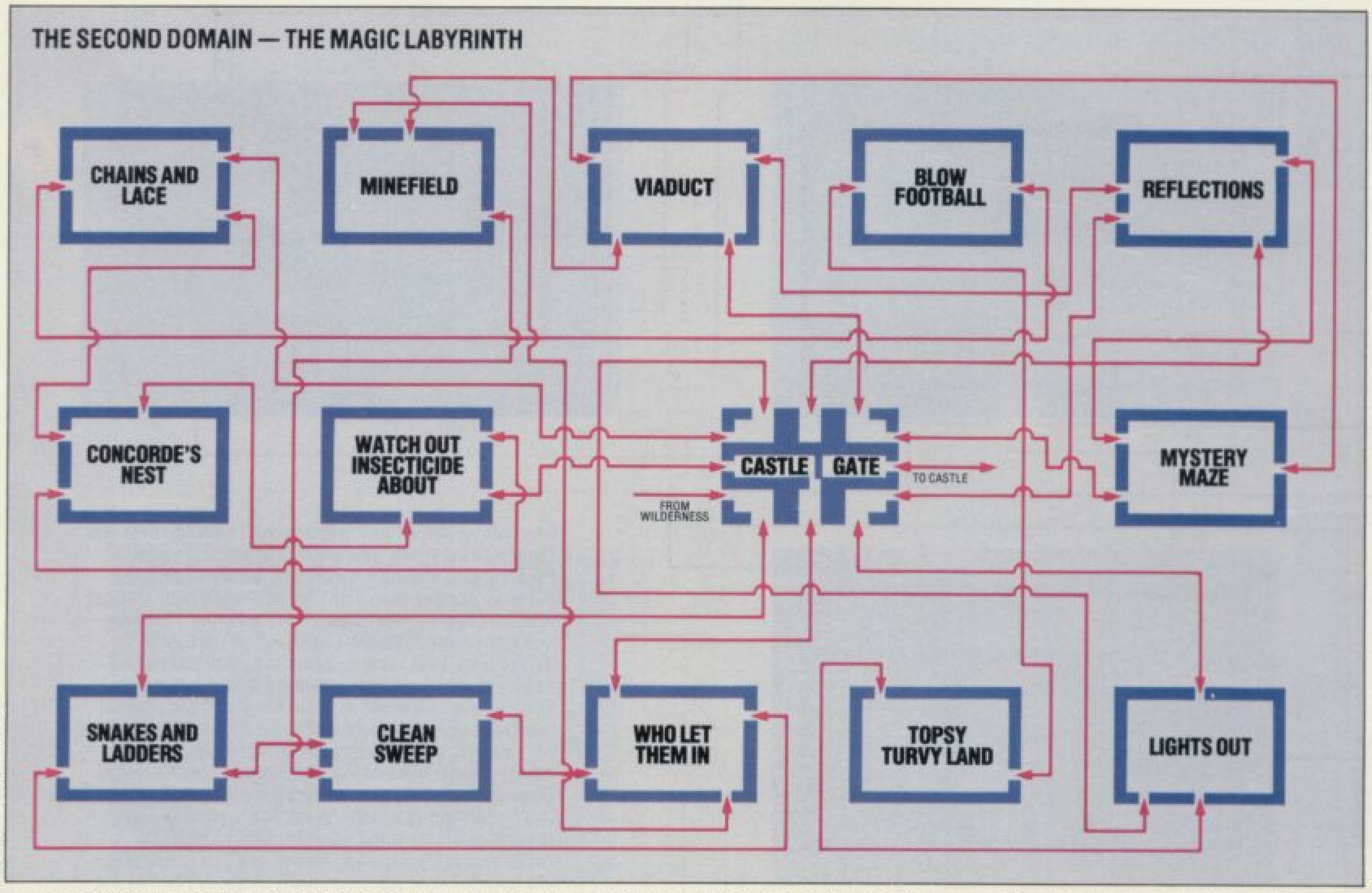
SIDE THE CASTLE WALLS





Once you've battled your way through The Wilderness and The Magic Labyrinth, you'll find your way across the drawbridge is no longer barred and, throwing caution to the wind, you can now enter The Castle, gird loins, and get eyeball to eyeball with Rapscallion the Rogue. There are four main interconnecting rooms within The Castle: Battlements, Bedchamber, Banqueting Hall and Library. And if you get fed up with wandering through doors, try going through a window or the like — you'll find yourself spirited (sic) away into another room; in fact, this is the only way you can get to three particular locations on this level — Castle Cellar, Mouse House and Secret Passages. Zipping through the rooms using this high-speed system, you'll soon find your way around. The accompanying illustration shows some possible routes through the castle's rooms — just keep moving and you're bound to end up in the right place eventually! Actually you may not find it *quite* that simple — even with the help of our map; to our shame, we've still to see the freehold deeds to the crumblin' ole pile! See how you get on ...





JANET BARRANCE

As you may have gleaned from the above maps, the sequence of room positions is hardly what you would call logical ... in fact, it's all a bit of an elephant's ear. The best way to familiarise yourself with your surroundings is, once you've fallen foul of one of the baddies, to have a wander round in your ethereal form; remember where you left your body though — you'll need it to continue the adventure. In the first level — The Wilderness — your task is to unearth the pixies and then touch them; they provide extra lives as well as the power to make visible the key to The Magic Labyrinth. Once that key is found, you can make your way into it and start searching for the three wizards; again, the best approach is to scout out the path ahead as a ghost.

RAPSCALLION RAP

or pixies will do you no good at all. To continue with the game proper, you just have to return to your physical form, via a press of the 'transform' key.

WHERE TO NOW?

Two things struck me in particular. First is the annoying, illogical way you leap from room to room. In The Wilderness sector there are 20 rooms to move through, each with a number of exits. But leaving (for example) the top left of one doesn't mean you'll appear in the top right of the room that should theoretically be next to it. You could appear on the bottom right of the room below it! These jumps from room to room *are* always the same, so mapping can be done *(Thank goodness. Ed)*; it's just difficult to do graphically. The best approach is probably to make a list of rooms, their exits and where they lead to.

Then there's the humour ... well, I suppose it has a 'silly' appeal. If you liked the idea of chomping toilets in *Manic Miner* then I'm sure elements of *Rapscallion* will go down well. One of my favourites is the Concorde's nest, showing two baby Concorde planes hatching from eggs and then growing in size as they zig-zag up the screen; then there are rooms where you find yourself in a game of blow football, or snakes and ladders.

Fast reactions and good co-ordination are not exactly *de rigeur* here, but that said you can't allow yourself to relax completely. Losing lives early on in the game must be avoided because some transformations between characters are unavoidable and it's very annoying to find further progress blocked for want of a couple more. You can, however, gain extra lives by finding and touching one of the pixies; the trouble is he won't always be in the same room. In fact, there are 16 different layouts for the gems and pixies, which supposedly mean 16 different adventures. In practice, though, the variation didn't seem to make much difference; as long as you seek out all the pixies on each level, there's no reason why you shouldn't progress fairly easily.

MOVING ON...

Collect your key in The Wilderness and you'll gain instant access to The Magic Labyrinth — where your quest is to gain the power of the Magic Eye. Get that and you'll make three wizards visible, ticklish gents who have to be approached while resting. The rooms in this sector are more difficult to negotiate but there are fewer in number (just 14). Only when all three wizards have been enlisted to your cause can you enter The Castle.

That's when things really get confusing. Not only does each of the seven rooms have a number of standard exits, there are also secret passages which lead to different parts of the other rooms, many of which are partitioned off into small and restricting areas. And to make life even tougher, Rapscallion the Rogue has a habit of appearing in some rooms, should you hang around too long. He doesn't directly attack you — after all, why should he care if a bird or fly is roaming around his castle? Anyway, things like that definitely make the going tough once you start investigating The Castle itself.

The object you're after here is a Magic Wand and to help, first you'll need to dig out two genies. That may seem difficult as you jump randomly through the passages, but try taking it systematically and you'll soon learn the routes needed. Once you've gained the Magic Wand, all you have to do is find Rapscallion the Rogue and touch him. Do that and (assuming you didn't LOAD a SAVEd game) you'll have the freehold of your castle back and be restored to the throne. As permanent proof of your wondrous achievements, you can enter your name on the title deeds and SAVE it off as a SCREEN$.

SO WHAT?

Rapscallion may not have the wonderful graphics routines of so many of its contemporaries, but it's still fun to play. I managed to finish it after a few goes, so I'm not sure that true hardened games players will find it durable. On the other hand, it does have qualities which make it worth more than a passing glance. YS

OLYMPICS 84

48k ZX Spectrum

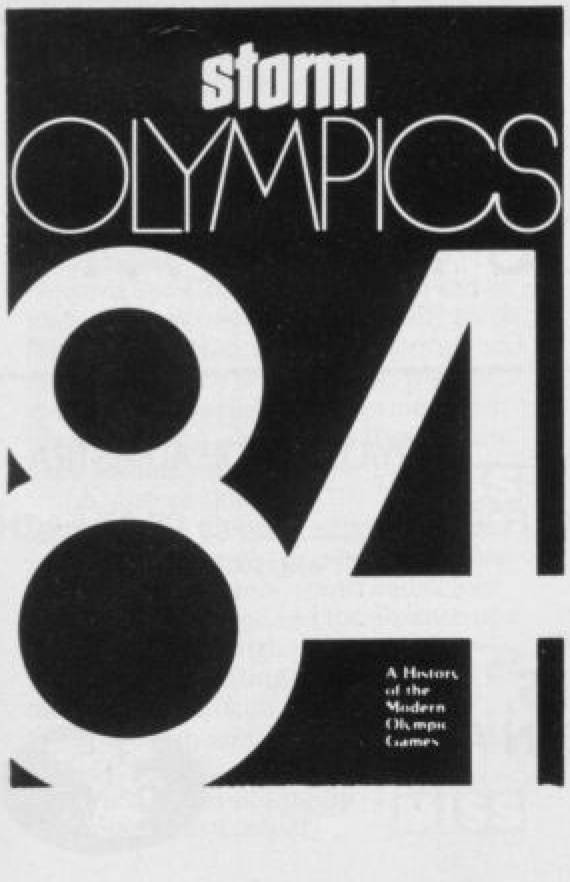
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JOYSTICK JURY

Your Spectrum *is on the lookout for clubs to take part in Joystick Jury. Interested??? Just drop a line to* Ron Smith, Joystick Jury, Your Spectrum, 14 Rathbone Place, London W1P 1DE.

This month's joystick jurors are all members of the Stevenage Computer Club, 106 Mobbsbury Way, Stevenage, Herts. They are: Ian Hemmingway, Phil Morse, Frank Pelling, Owen Pugh and Monty Trent.

The club was formed about 18 months ago and currently has a membership of about 45, with members' ages ranging from eight to 70 years. It meets twice a month — at the Stevenage Library and the Leisure Centre. Membership costs £6 per year... half price for children and OAPs. For more details, phone Frank Pelling on 0438 353659 (evenings and weekends).









BULLSEYE
Mastertronic/£1.99

The five darts games on this tape comprise 501, Cricket, Round the Board and Noughts and Crosses, all of which can be played on any one of four difficulty levels.

Monty The graphics are below average and the colour is only a little better. But the speed is what really lets this game down; the whole thing is written in Basic. It also has a tendency to 'crash' unaccountably. **MISS**

Frank This will probably appeal to older gamesters, but might be a bit tedious for youngsters. Graphics, speed and colour are all fairly average and the absence of a crowd-roar for a high score is disappointing. **HIT**

Ian Darts is a difficult game to transfer on to a computer, and is probably a bad idea anyway. But this could have been improved by a speeding-up and better use of colour. **MISS**

METAGALACTIC LLAMAS
Salamander Software/£6.95

Mutants descend from webs that break when bombarded with well-aimed spit. The creatures then drop to the surface and mutate into Weeviloids.

Frank Both colour and graphics are fairly pleasing, if not spectacular, and the speed seems to match the action quite well. It's easy on the eyes and fingers, but not particularly addictive. **MISS**

Phil The distracted Llama and the ricocheting spit are both quite novel, and graphically very good. There are different speeds for spiders, Weeviloids and the Llama, all of which are adequate. **MISS**

Ian Everything in this game looks good — well-defined graphics, fast speed, excellent choice of colour and pleasant sound. The only problem is it requires almost no effort to succeed. **HIT**

PSI-SPY
Postern/£7.95

In the labyrinth of the wandering planet, there is great wealth and adventure for anyone willing to challenge the active guardians. Collect the five keys of Zar, for without them, exit is impossible.

Ian Excellent graphics with some very fine detail — all made even better by the choice of some vivid colours. It can even be bewildering until you've worked out what's going on. **HIT**

Phil It looks good, and probably sounds good (it supports the Currah MicroSpeech unit), but it does appear to be needlessly complicated. After a dozen attempts, it's still not really clear what you should be doing. **MISS**

Frank A photographic mind would be an advantage for memorising all the instructions in this over-complicated game; even so, once understood, it's enjoyable. **HIT**

JOYSTICK JURY



THE FALL OF ROME
ASP/£6.99

Take command of Rome and help it to survive while the Eastern Empires are causing trouble. You have the resources of the entire Empire at your disposal; used wisely, they might just stop civilisation being swept away by the warring tribes.

Frank Attempting to quell the fall of Rome can really be quite addictive — providing you don't expect too much razmatazz-type action. A few battle scenes would improve matters. **HIT**

Ian This is a good idea for a strategy game, even though the graphics aren't exactly spectacular. The map is drawn well and the result is an acceptable screen display. **HIT**

Phil The inputting of all the variables is very tedious — and so is waiting for the program to make its calculations. It even responds with "Please be patient..." while it's thinking. **MISS**



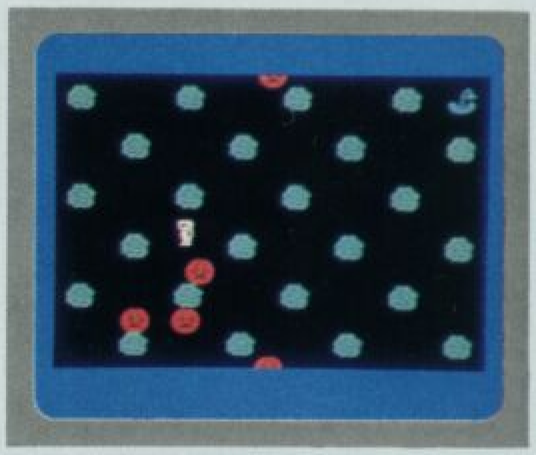
BUFFER ADVENTURE
Buffer Micro Ltd/£5.95

You enter the Buffer Micro shop in order to discover what goes on behind the scenes. Unfortunately, it's not possible to leave until you locate your missing credit cards and the beastly staff insist on you buying your way out.

Frank It's refreshing to come across an adventure with a theme that's quite different from all the others... it's just a pity there are no graphics. The humour is good. **HIT**

Ian An adventure behind the closed doors of a well-known, south London computer shop is a very good idea and this one is particularly well executed; very playable and difficult. **HIT**

Phil While the idea behind this game is fairly good, it does suffer from being text-only and the overall presentation is average. It also takes a long time to escape. **MISS**



REVENGE OF THE KILLER TOMATOES
Visions/£6.95

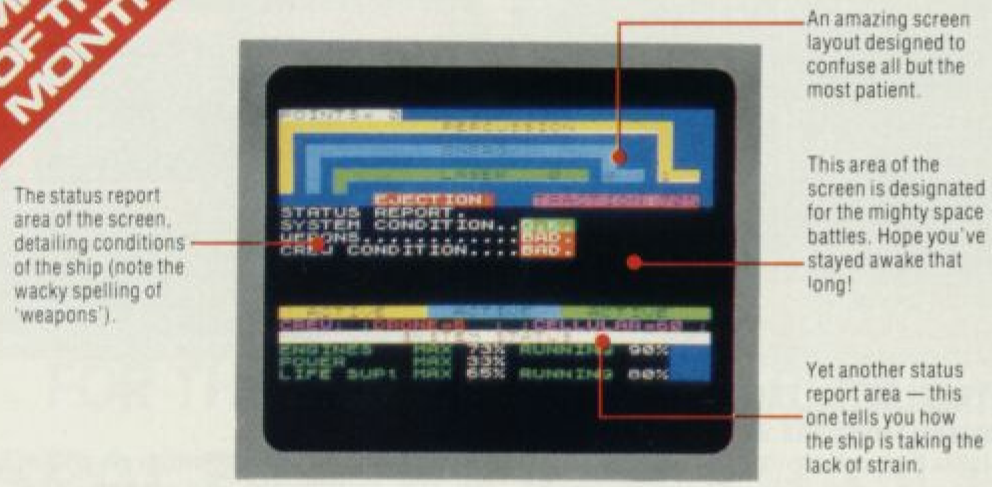
Meanwhile, back on the vegetable patch, help the market gardener to escape from the killer tomatoes, manic mushrooms and psycho swedes.

Ian Play begins at a fairly fast speed and increases as you progress, though not to the point where the game becomes too difficult. **HIT**

Frank The graphics aren't really very inspiring, and the colours are rather dull — neither of which exactly encourage you to play on. However, the game improves a little if you're using a joystick. **MISS**

Monty Sorry, but this one's really boring and unoriginal — despite the title! Gardening isn't much fun at the best of times, but it's made even worse here with the threat of angry vegetables coming after you. It's lasting appeal is absolutely zilch. **MISS**

MISS OF THE MONTH



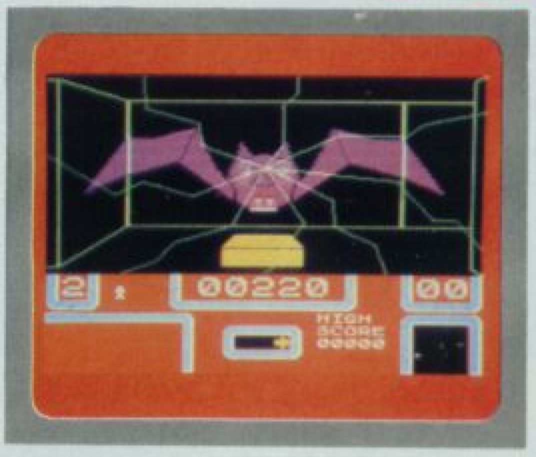
KOSMIK PIRATE
Elephant Software/£5.95

As the captain of space craft Red Beard 2, you begin a reign of terror in the outer orbits of Earth. Decisions are made via the on-board computer — because, unfortunately, RB2 is out of date and doesn't possess the obligatory 'chase' feature, found in all modern craft.

Ian It's a game that tries to incorporate graphics action with information from the on-board computer. Unfortunately, the graphics are more like those to be found in ZX81 programs, and the text is often unreadable — because of the poor choice of colours. Playability is virtually non-existent, and it won't keep anyone sitting at their machines for long.

Frank The most exciting features of this game are the blue and yellow lines that squiggle over the screen as the program is loading. The graphics are unclear and ill-defined, while the colours blend so well that it's not always possible to read the displayed information; the sound just makes matters still worse.

Owen The game is quite fast, and responds quickly to your commands; it's just a pity it doesn't include a self destruct button! There's almost no sound, which means that it can't irritate you too much; unfortunately, the graphics are aggravating and distinguishing between items of printed information is virtually impossible.



3D BAT ATTACK
Cheetah Soft/£6.95

Trapped inside a 3D maze, trying to gather up gold blocks, your task is to fight your way along to the next level.

Frank Oh, no, not another maze game! The 3D representation of the walls is OK, and so are the bats. Use of colour is adequate, which gives quite reasonable clarity. But it's still just another unoriginal program. **MISS**

Phil This game (or one very like it) first appeared as a listing in a certain magazine under the title of *3D Dracman.* It was OK for free, but as a commercial product, it's awful. Graphics, colour and speed are all uninspiring. **MISS**

Ian Players can choose their own degree of difficulty by entering on different levels, with a greater or lesser number of bats. Both the graphics and the colour are above average, making for a very playable game. **HIT**



CARNIVAL
Eclipse Software/£5.95

This is a good old shooting gallery game where your job is to clear all the targets from the first round, then shoot the prowling bears before moving on.

Owen The sound sets the right mood for a stint in the shooting gallery, and the graphics spur you on even more. The problem is the game is easy, and soon gets boring. **MISS**

Ian The graphics are average and not too exciting, and much the same can be said for the use of colour. The six available speeds help things along a bit, and it's probably very suitable for young children. **HIT**

Frank While it might be ideal for computer games novices, it's still just another version of an arcade shooting gallery program. Most disappointing of all is the distinctly unimaginative use of colour. **MISS**

HIT OF THE MONTH



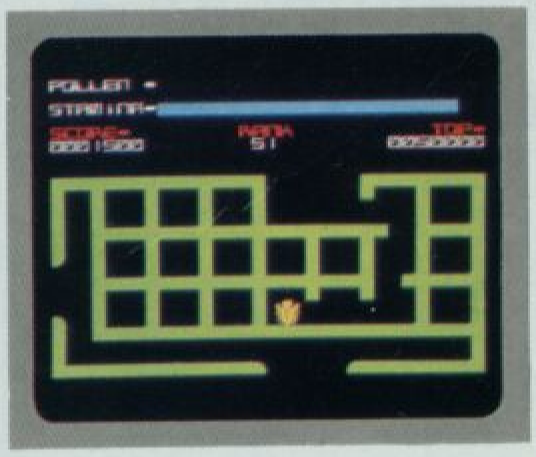
PSYTRON
Beyond Software/£7.95

The player eventually becomes the Psytron — something less than human and more than a computer — and is put in charge of the Betula 5 installation. Your job is to cope with the defensive demands when the attack comes. The overall aim is to process the information (and highly detailed it is) supplied in the 20-page booklet accompanying the program.

Ian The graphics are excellent, with instant access to the ten views around your base, all of which detail the surrounding buildings and landscapes. And a near perfect use of colour goes even further towards making the overall display startlingly clear. Each year a program comes along that sets the standard by which the others must be judged. *Psytron* is 1984's yardstick.

Frank The idea is simply splendid, and there's so much going on it's impossible to get bored. With its well-defined, clear and colourful graphics, and a manageable but challenging speed, the game is addictive from the very start, and gets more so as the player progresses.

Phil There are six levels to the game, but it'll take a great deal of practice to get there — especially as the speed is very fast. However, there's not a lot of sound used, but this goes unnoticed alongside the superb graphics. Overall, it's one of the most interesting games to come on to the market.



ANTICS
Bug-Byte/£5.95

Boris Bee has been captured by the vicious ants and is being held captive somewhere in their nest. Luckily, help is at hand in the shape of cousin Barnabee.

Frank The idea's quite good, but it's not clear why a bee should be found in an ants' nest. Nevertheless, realistic use of colour, high-standard graphics and a comfortably slow playing speed make playing enjoyable. **MISS**

Ian A very addictive game that'll give hours of amusement, even though there are many similar programs on the market. A lot of thought has gone into the graphics. **HIT**

Phil Barnabee buzzes sedately around, while the ants and bugs tramp after him. The 'nibbling' sound effects are rather nice and it's well worth buying if only for the superb demonstration of the sound capabilities. **HIT**



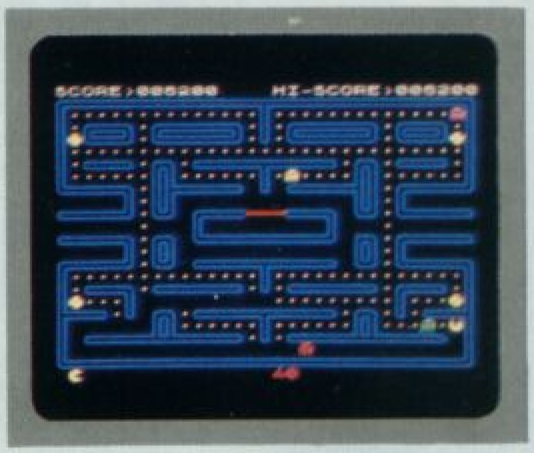
MILLIONAIRE
Incentive Software/£5.95

Having just written what you consider to be a commercially viable program, your job now is to try and sell it. With just £500 of your own, the ultimate aim is to achieve millionaire status.

Frank Since 95 per cent of this game is question and answer; the graphics aren't really important — even so, they look good. For me, there's nothing like testing your ability to succeed in business. **HIT**

Ian There are many games of this type on the market, but wheeling and dealing in an effort to make a million is great fun — especially with characters like 'Honest Harry'. **HIT**

Phil While it's fun to play, the lack of originality is a big problem. And I found the virtual absence of graphics and sound tended to make playing just a little tedious. **MISS**



PAC-MAN
Atarisoft/£9.95

The Pac-man, as usual, scores points by eating all the dots in the maze while avoiding the pursuing ghosts. There are four flashing power pills, located one in each corner of the screen.

Owen It's totally unoriginal, but that doesn't make a bit of difference to the playability. The speed increases as you progress and the colour is just right. **HIT**

Ian Atari has Spectrumised its old favourite — it's just as good as the original and is not likely to be equalled. It's also nice that all the sound effects have been included. **HIT**

Frank Technically, it's as good as most other *Pacman* type games, and no doubt some people will go for it. However, there must be better similar games now available, even though the speed gets quite challenging. **MISS**

SOFTENING UP THE HARDWARE

Once you've built the DIY Centronics interface from last month's issue, you're ready for **John Flenley's** *software to get you into print; and here it is...*

Last month, we looked at a circuit for a Centronics parallel interface for the ZX Spectrum. So, assuming all you out there have now constructed perfect working units, the time has come for us to go through the software that's required to drive it.

SAFETY FIRST

The main problem with having a piece of driver software resident in RAM is that sometimes it can interfere with another piece of code, preventing you from printing anything while it's loaded. To overcome this, I've made our driver software self-relocating — that is, it'll move itself to a safe area after loading. To achieve that happy end, the code is first loaded into a work area, at address 26000. (This is outside the area required for Microdrives, and will not need changing if you intend putting the software on that medium.)

Let's take a more detailed look at the software. The first program you'll come up against is the Basic loader program, which also does a little housekeeping.

```
10 LOAD "" CODE 26000
20 LET k = USR 26000
30 CLEAR k
40 PRINT "Code loaded. To turn off token
printing" ' "POKE any number except 0 into
23296" ' "To turn the facility off," '
"POKE 23296,0"
```

The short Basic loader program; this should be typed in first of all and SAVEd.

The function of line 10 is obviously to load the driver code into the workspace and line 20 passes control to the machine code routine at 26000. It's a function of the Spectrum operating system that the content of the Z80 BC register pair is returned to Basic when exiting from a USR subroutine; thus LET k = USR 26000 means that, on exiting from the code that begins at address 26000, the BC register pair contents will be put into the variable k. The monitor at 26000 ensures that at exit time, BC holds an address below the driver software, so that line 30 can use the CLEAR command and reset RAMTOP to the new position. Resetting RAMTOP below the driver software offers protection against it being overwritten.

STEP BY STEP

Let's take a look now at the listing of the driver code. The left-hand side contains only line numbers and these should not be mistaken for addresses or op-codes. If you have an assembler, then you can type in the listing as it stands; if not, you'll have to use the data block and a sophisticated Hex loader — which I'll provide you with later.

Looking first at the monitor part of the listing (lines 0000-0110), here we take the current Basic stack pointer and save a copy in HL. Next, 80 is subtracted from it to give a safe address for us to work — that is, for stack workspace. This address is where the end of the driver software will be, after relocation. So, where will the start be? Well, that's calculated by lines 0120-0150. Line 0120 loads DE with the length of the driver code, and if we subtract that length from the address of the end of the code, we get the address of the start of the code — which is saved at a location labelled NSTART. Simple, eh?

Progressing to lines 0160-0190, here is where we calculate the difference between where we are and where we will be — storing it at a location labelled DELTA. Line 0200 loads HL with the base address of the channel information; the channel information contains addresses of the input and output routines associated with that channel. For our application, we want to divert Channel 3, the printer channel. Each entry in the channel table is five bytes long, and therefore the beginning of the Channel 3 entry will occur 15 bytes after the start of the table.

CALL and table addresses must be altered to reflect their new position after relocation. Lines 0210-0350 do this, using the difference in addresses already calculated (DELTA). This routine of four instructions will be repeated for the other three alterations required, at labels CC2+1, CC3+1 and CC4+1 (see lines 0450-0480). This is where the actual move takes place, using the block move command LDIR.

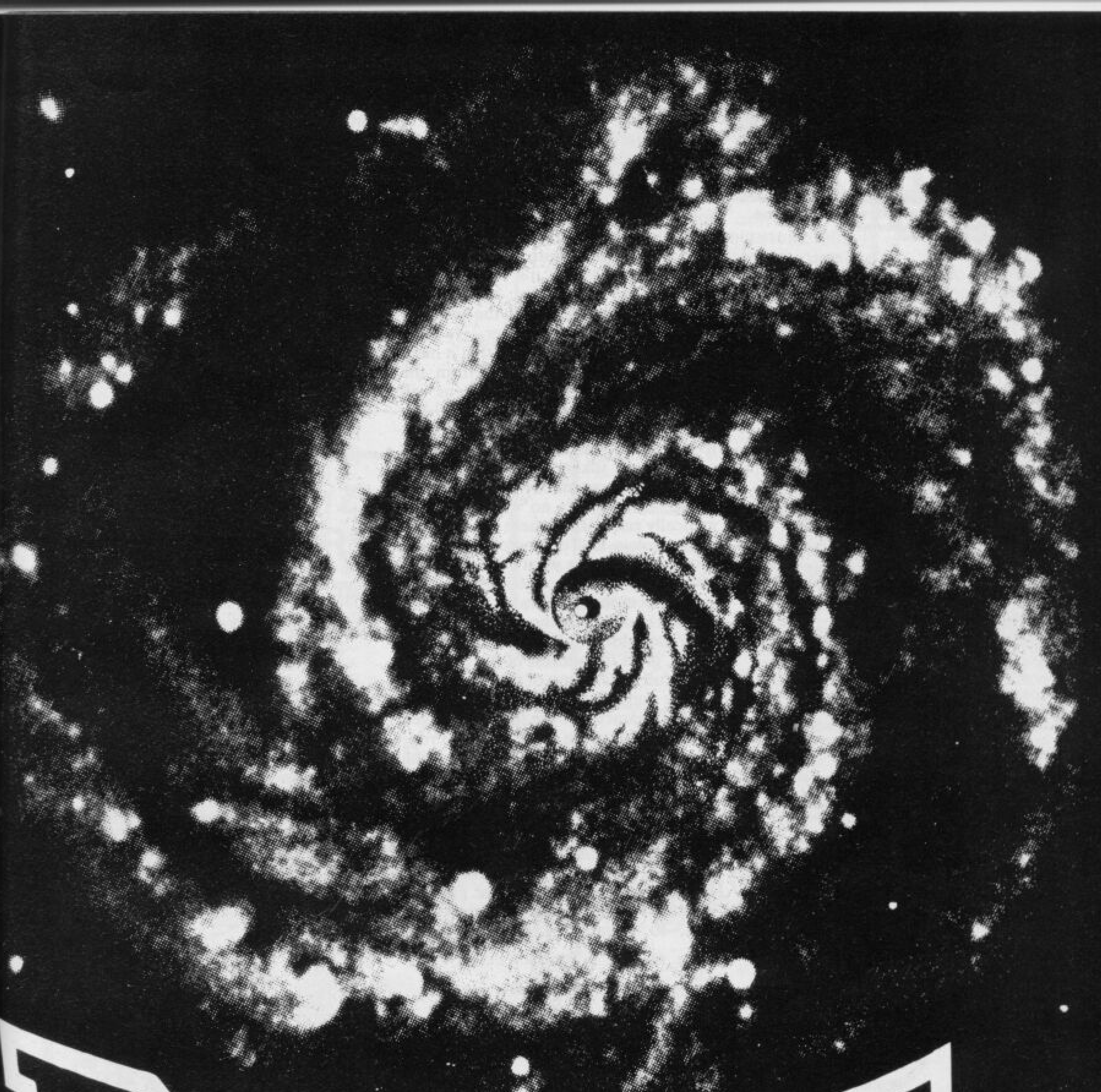
Look now at lines 0490-0540. The BC register pair is set up for its return to Basic. This is to ensure it contains the new address to which RAMTOP must be set — in order to protect the code that's just been moved. The flag byte TOKEN is cleared so that token printing occurs initially and then the return to Basic is effected.

The above routine has reset the channel information so that it can tell the Spectrum operating system that, when it wants to output a character to the printer, it should pass that character to our routine, and not now the ZX Printer routines. The operating system will enter our routine with the ASCII code of the character to be printed, in the accumulator A.

TALKING FORMATS

Before going on with the listing, it's perhaps prudent to discuss the format of a Spectrum Basic line. The Basic keywords stored are not in their full ASCII form (for example, GO SUB is not stored as the five ASCII characters 'G', 'O','S','U' and 'B', but as a single byte 'TOKEN', whose values are in the range 165 to 255). If we are to print these correctly, then we must intercept all bytes in that range and decode them into their full ASCII form. Hang on though... if we want to send graphic data to the printer, then we need to send bytes in that range that do *not* need decoding. To overcome this problem, the driver routine has a 'flag byte' labelled TOKEN. This is resident at location 23296 in the now defunct ZX Printer buffer, and is normally set to zero — which ensures that tokens are decoded correctly. If you wish to send data bytes to the printer, and *don't* want them decoded, then you must first POKE 23296 with any value other than zero, and token printing will be disabled.

```
00000            ORG 26000
00010 ;
00020 NSTART     EQU 23298
00030 DELTA      EQU 23300
00040 TOKEN      EQU 23296
00050 STACK      EQU 23303
00060 ;
00070 START     LD (STACK),SP
00080           LD HL,(STACK)
00090           LD DE,80
00100           AND A
00110           SBC HL,DE
00120           LD DE,CEND-PRTRTN
00130           AND A
00140           SBC HL,DE
00150           LD (NSTART),HL
00160           LD DE,PRTRTN
00170           AND A
00180           SBC HL,DE
00190           LD (DELTA),HL
00200           LD HL,(#5C4F)
00210           LD DE,15
00220           ADD HL,DE
00230           PUSH HL
00240           LD HL,(DELTA)
00250           LD DE,PRTRTN
00260           ADD HL,DE
00270           EX DE,HL
00280           POP HL
00290           LD (HL),E
00300           INC HL
00310           LD (HL),D
00320           LD DE,(DELTA)
00330           LD HL,(CC1+1)
00340           ADD HL,DE
00350           LD (CC1+1),HL
00360           LD HL,(CC2+1)
00370           ADD HL,DE
00380           LD (CC2+1),HL
00390           LD HL,(CC3+1)
00400           ADD HL,DE
00410           LD (CC3+1),HL
00420           LD HL,(CC4+1)
00430           ADD HL,DE
00440           LD (CC4+1),HL
00450           LD HL,PRTRTN
00460           LD DE,(NSTART)
00470           LD BC,CEND-PRTRTN
00480           LDIR
00490           LD BC,(NSTART)
00500           DEC BC
00510           DEC BC
00520           XOR A
```



RACE

```
00530              LD (TOKEN),A
00540              RET
```

The code of the next character to be printed is sent to the following part of the program via the accumulator.

```
00650 PRTRTN       CP 32
00660              JR NC,PRR1
00670              CP 13
00680              JR Z,PRT
00690              LD B,A
00700              LD A,(TOKEN)
00710              OR A
00720              RET Z
00730              LD A,B
00740 PRR1         CP 165
00750              JR C,PRT
00760              LD B,A
00770              LD A,(TOKEN)
00780              OR A
00790              LD A,B
00800              JR NZ,PRT
00810              SUB 165
00820              LD H,0
00830              LD L,A
00840              ADD HL,HL
00850 CC1          LD DE,OFFTAB
00860              ADD HL,DE
00870              LD E,(HL)
00880              INC HL
00890              LD D,(HL)
00900              LD HL,150
00910              ADD HL,DE
00920              LD A,32
00930 CC2          CALL PRT
00940 P1           LD A,(HL)
00950              BIT 7,A
00960              JR NZ,LAST
00970 CC3          CALL PRT
00980              INC HL
00990              JR P1
01000 LAST         RES 7,A
01010 CC4          CALL PRT
01020              LD A,32
01030 PRT          PUSH AF
01040 DTR          IN A,(223)
01050              BIT 4,A
01060              JR Z,P11
01070              CALL BREAK
01080              JR DTR
01090 P11          POP AF
01100              OUT (223),A
01110              RET
01120 BREAK        LD A,#7F
01130              IN A,(#FE)
01140              RRA
01150              RET C
01160              LD A,#FE
01170              IN A,(#FE)
01180              RRA
01190              RET C
01200              LD HL,10000
01210 LP           DEC HL
01220              LD A,H
01230              OR L
01240              JR NZ,LP
01250              LD A,13
01260              OUT (223),A
01270              RST 8
01280              DEFB 12
```

The table of offset values holds all the vital information the program needs to break down keywords into ASCII equivalents.

```
01380 OFFTAB DEFW 0,3,9,11,13,18
01390 DEFW 25,29,31,34,38,42,45
01400 DEFW 48,51,54,57,60,63,66
01410 DEFW 68,71,74,77,80,83,87
01420 DEFW 89,92,96,100,103,106
01430 DEFW 108,111,113,115,117
01440 DEFW 121,125,127,131,137
01450 DEFW 140,146,150,155,161
01460 DEFW 168,173,179,183,189
01470 DEFW 192,197,202,208,215
01480 DEFW 219,222,228,233,237
01490 DEFW 241,245,252,255,261
01500 DEFW 269,272,275,278,283
01510 DEFW 289,294,298,302,305
01520 DEFW 310,314,318,323,327
01530 DEFW 330,334,343,345,348
01540 DEFW 352,357,363
01550 CEND DEFB 0
```

As well as token bytes, a Basic line can also contain bytes in the range zero to 31. These are used to convey information to the Spectrum PRINT routine about the colour of the line, and various other things besides. These characters are not standard ASCII and will do silly things to your printer, unless you filter them out. The only code that you want in this range is 13, (Carriage Return). The TOKEN flag is again used. If it's zero, then all codes under 32 (except 13) are discarded; if it's not zero, then the bytes are passed through to the printer.

When the routine decides that it has a token, it first subtracts 165 from the value — which means that tokens will have values in the range zero to 90. To save space, I've used the token table in ROM, which contains the full ASCII version of each token. However, as each token (when expanded) is not of equal length, then there's no way of mathematically calculating where the first byte of any token is. To overcome this, the driver routine uses what's known as an offset table — which contains a two-byte entry for each token value. The entry consists of a number that, when added to the base address of the token table in ROM, gives the address of the first byte of the full ASCII form of that token. One further point about the table in ROM — the last character of the token is flagged by having bit seven turned on; the routine must check for this when reading from the table.

TIME FOR A BREAK

Returning to the assembly listing, note that in the BREAK routine, if a break is detected we try to send a Carriage Return character to the printer. (A lot of printers require a CR character to be sent, to initiate the printing of the printer's internal buffer. If it wasn't, then after BREAKing we could be left with a buffer full of data in the printer.) The delay loop is present to give the printer time to return to its 'NOT BUSY' status, and thus be able to receive the byte. Without the loop, we are unable to check the printer status by reading in from the port and waiting for the BUSY line to go low; after all, there's always the possibility that something dreadful has happened to it (that is, you've switched it off) in which case, BUSY will never go low, and your program will never return to Basic.

```
   1 BORDER 1: PAPER 1: INK 7: C
LS
   5 POKE 23609,50: REM keyboard
 bleep
  10 POKE 23658,8: REM ensure ca
pital letters
  15 FOR i=30000 TO 30392 STEP 8
: LET addr=i
  16 LET c=0: FOR x=1 TO 8
  20 GO SUB 100
  50 LET num=hi+lo: POKE addr,nu
m
  55 PRINT i$;" ";: LET c=c+num:
 LET addr=addr+1: NEXT x
  56 LET j=INT (c/256): LET c=IN
T (c-(j*256)): GO SUB 100
  57 LET num=hi+lo: IF c<>num TH
EN  GO TO 60
  58 PRINT "OK": NEXT i: SAVE "C
ENcode"CODE 30000,400: STOP
  60 PRINT "HASH CHECK - Re-ente
r line": LET addr=addr-8: GO TO
16
 100 INPUT i$
 110 IF LEN i$<>2 THEN  GO TO 20
 120 IF i$(1)<"0" OR i$(1)>"9" A
ND (i$(1)<"A" OR i$(1)>"F") THEN
  GO TO 20
 130 IF i$(2)<"0" OR i$(2)>"9" A
ND (i$(2)<"A" OR i$(2)>"F") THEN
  GO TO 20
 140 LET n=1: LET hi=16*FN h(i$,
n)
 150 LET n=2: LET lo=FN h(i$,n)
 160 RETURN
1000 DEF FN h(i$,n)=CODE i$(n)-4
8-7*(CODE i$(n)>57)
```

The Hex loader program — included for those not blessed with an assembler.

```
ED 73 07 5B 2A 07 5B 11 5F
50 00 A7 ED 52 11 23 01 6B
A7 ED 52 22 02 5B 11 FA 70
65 A7 ED 52 22 04 5B 2A F6
4F 5C 11 0F 00 19 E5 2A F3
04 5B 11 FA 65 19 EB E1 B4
73 23 72 ED 5B 04 5B 2A D9
1C 66 19 22 1C 66 2A 29 92
66 19 22 29 66 2A 31 66 F1
19 22 31 66 2A 39 66 19 B4
22 39 66 21 FA 65 ED 5B 89
02 5B 01 23 01 ED B0 ED 0C
4B 02 5B 0B 0B AF 32 00 9F
5B C9 FE 20 30 0B FE 0D 88
28 3B 47 3A 00 5B B7 C8 BE
78 FE A5 38 30 47 3A 00 04
5B B7 78 20 28 D6 A5 26 73
00 6F 29 11 67 66 19 5E ED
23 56 21 96 00 19 3E 20 A7
CD 3D 66 7E CB 7F 20 06 5E
CD 3D 66 23 18 F5 CB BF 2A
CD 3D 66 3E 20 F5 DB DF 7D
CB 67 28 05 CD 4D 66 18 F7
F5 F1 D3 DF C9 3E 7F DB F9
FE 1F D8 3E FE DB FE 1F 29
D8 21 10 27 2B 7C B5 20 AC
FB 3E 0D D3 DF CF 0C 00 D3
00 03 00 09 00 0B 00 0D 24
00 12 00 19 00 1D 00 1F 67
00 22 00 26 00 2A 00 2D 9F
00 30 00 33 00 36 00 39 D2
00 3C 00 3F 00 42 00 44 01
00 47 00 4A 00 4D 00 50 2E
00 53 00 57 00 59 00 5C 5F
00 60 00 64 00 67 00 6A 95
00 6C 00 6F 00 71 00 73 BF
00 75 00 79 00 7D 00 7F EA
00 83 00 89 00 8C 00 92 2A
00 96 00 9B 00 A1 00 A8 7A
00 AD 00 B3 00 B7 00 BD D4
00 C0 00 C5 00 CA 00 D0 1F
00 D7 00 DB 00 DE 00 E4 74
00 E9 00 ED 00 F1 00 F5 BC
00 FC 00 FF 00 05 01 0D 0E
01 10 01 13 01 16 01 1B 58
01 21 01 26 01 2A 01 2E A3
01 31 01 36 01 3A 01 3E E3
01 43 01 47 01 4A 01 4E 26
01 57 01 59 01 5C 01 60 70
01 65 01 6B 01 00 00 00 D3
```

The Hex dump of the Centronics software — type this in using the Hex loader; the last byte of each row is a checksum value.

To create this software, you'll need the Basic loader program mentioned earlier in this piece — plus the block of code provided. Those with an assembler will find no problem creating the block; however, those who feel insecure at the sight of machine code should type in the Basic loader program and SAVE it — then type in and RUN the Hex loader given. It'll ask you to enter the code block and, when finished, it'll save the finished block at address 30000. It should, of course, go at location 26000, and the Basic loader LOADs that by LOADing it at that address.

When you wish to make use of your Centronics interface, just type in LOAD "name" and all the relevant code will be loaded. Happy printing! ■s

BASIC AT A STRETCH

Tired of using the same old commands? Well, saddle up your Interface 1 unit and let* Gavin Smyth *demonstrate the practice of adding up to 26 new commands to your Spectrum.

Sinclair Basic, for all its slowness, is fairly comprehensive. But as with all things, the more you have, the more you want and a few extra commands might certainly come in useful. How about, for instance, an absolute draw. With Interface 1 attached, it's possible to add as many extra commands as you like.

First, let's look at the extended interpreter and the individual routines in detail.

NEW INTERPRETATIONS

When a line of Basic is entered, the original ROM checks its syntax; if it fails to recognise the command, it passes control over to the Interface 1 ROM. This scans the line checking for new words such as 'FORMAT'. If this test also fails, the processor jumps to the error handling routine (at ERR6) via the vectored address at 23735. You can alter this address and have further tests implemented to provide extra commands.

This is what the extended interpreter does. It checks for the presence of an asterisk at the beginning of a statement followed by a letter; with this simple test, however, only 26 new commands can be invented. If it finds no asterisk or letter it gives the usual syntax error. If all is correct, it jumps to the actual routine via the table of vectors. Note that unimplemented commands point to the error handler. The individual command routines check the rest of the syntax and contain the runtime routine.

For the interpreter to function properly, there must be at least one space between the new command word and any following arguments. The command word must start with an asterisk and a letter, followed by any (or no) characters at all.

ABSOLUTE DRAW

The first new command is:

***DRAW x,y**

Which draws to the point (x,y). It's much simpler to use than relative co-ordinates (especially in graphs). Thus:

PLOT 100,100: DRAW 20,30

Is equivalent to:

PLOT 100,100: *DRAW 120,130

First, the routine calls SPACE to get to the end of the first word (in this case, *DRAW). Then it checks for the presence of two numeric arguments separated by a comma; if there's something wrong it jumps to the error handler. In syntax time — that is, when the line is first entered into a program — the routine ends here; in runtime the rest is executed. This part simply calculates the size of the relative co-ordinates and calls the Basic ROM's DRAW subroutine.

When this subroutine is being executed, the Interface 1 ROM is paged in. This allows routines in the Interface 1's ROM, such as STEND, to be simply CALLed; routines in the main ROM, such as FNDINT1, have to be called via

```
    1 REM ** EXTENDED BASIC **
    2
    3 REM In line 20, set start
to the desired beginning of the
machine code, and in line 10,
CLEAR to the location before
    4
    5 REM This BASIC program will
relocate the code anywhere in
memory, but it is fairly slow
    6
    7 REM The machine code is 559
bytes long
    8
   10 CLEAR 64797
   20 LET start=64798
   30 LET a$=""
   40 FOR a=start TO start+558
   50 IF a$="" THEN  READ a$
   60 POKE a,FN h(a$)*16+FN h(a$(
2))
   70 LET a$=a$(3 TO )
   80 NEXT a
   99 REM Now relocate the code
  100 LET a=20: LET p=45: GO SUB
500
  110 LET a=53: LET p=99: GO SUB
500
  120 LET a=77: LET p=165: GO SUB
500
  130 LET a=83: LET p=267: GO SUB
500
  140 LET a=97: LET p=465: GO SUB
500
  150 LET a=100: LET p=31: GO SUB
500
  160 LET a=166: LET p=31: GO SUB
500
  170 LET a=268: LET p=31: GO SUB
500
  180 LET a=463: LET p=394: GO SU
B 500
  190 LET a=466: LET p=31: GO SUB
500
  200 PRINT "To use the extra com
mands, enter"
  210 PRINT '"POKE 23735,";start-
256*INT (start/256);": POKE 2373
6,";INT (start/256)
  220 STOP
  499 REM This routine sorts out
the absolute addresses to
relocate the program
  500 LET address=start+a+1
  510 LET pointsto=start+p
  520 POKE address,INT (pointsto/
256)
  530 POKE address-1,pointsto-256
*PEEK address
  540 RETURN
  899 REM function to convert a
hex digit to its decimal value
  900 DEF FN h(a$)=CODE a$-48-7*(
a$>="A")
  999 REM data for the machine
code program

 1000 DATA "D71800FE2AC2F001D720"
 1010 DATA "00E69FFE1B3801AF8721"
 1020 DATA "2DD806004F095E2356EB"
 1030 DATA "E9D77400FE20CBFE3AC8"
 1040 DATA "FE0D20F3C9F001F001F0"
 1050 DATA "01F00163DBF001F001F0"
 1060 DATA "01F001F001F001F001F0"
 1070 DATA "01F001F001F001A5D8F0"
 1080 DATA "01F0010BD9F001F001F0"
 1090 DATA "01F001F001F001D1D9CD"
 1100 DATA "1FD8D7821CFE2CC2F001"
 1110 DATA "D72000D7821CCDB705D7"
 1120 DATA "941E217E5C9638141601"
 1130 DATA "47C5D5D7941ED1C1217D"
 1140 DATA "5C96380A1E01180A16FF"
 1150 DATA "ED4418EB1EFFED444FD7"
 1160 DATA "BA24C3C105CD1FD8D782"
 1170 DATA "1CFE2CC2F001D72000D7"
 1180 DATA "821CFE2CC2F001D72000"
 1190 DATA "D7821CCDB705D7941ECB"
 1200 DATA "27CB27CB2716005F2A7B"
 1210 DATA "5C19E5D7941EF5D7941E"
 1220 DATA "C14FD13E08F5C5D7AA22"
 1230 DATA "F5E5D5D74D0DD7DB0BE1"
 1240 DATA "46D1EBF10E003CCB38CB"
 1250 DATA "193D20F9702371C10513"
 1260 DATA "F13D20D9C3C105CD1FD8"
 1270 DATA "D7821CCDB705D7941EE6"
 1280 DATA "03280AFE01282CFE0228"
 1290 DATA "15186C3EC0210040A706"
 1300 DATA "20CB1E2310FB3D20F5C3"
 1310 DATA "C1053EC021FF57A70620"
 1320 DATA "CB162B10FB3D20F5C3C1"
 1330 DATA "05A71100400603C53E08"
 1340 DATA "083E07626B24E5012000"
 1350 DATA "EDB0D13D20F3010007ED"
 1360 DATA "42E5012000EDB0D1083D"
 1370 DATA "20E001E00609545D0120"
 1380 DATA "00ED42EBEDB0C110CC21"
 1390 DATA "E05706207723 10FCC3C1"
 1400 DATA "0511FF570603C53E0808"
 1410 DATA "3E07626B25E5012000ED"
 1420 DATA "B8D13D20F301000709E5"
 1430 DATA "012000EDB8D1083D20E1"
 1440 DATA "01E006ED42545D012000"
 1450 DATA "09EBEDB8C110CD210040"
 1460 DATA "0620C38AD9CD1FD8D782"
 1470 DATA "1CCDB705D7941EA72832"
 1480 DATA "FE012809FE02280DFD36"
 1490 DATA "000AEF01800121100018"
 1500 DATA "0601FFFE21201B110400"
 1510 DATA "3E10C5D5E5F5D7B503F1"
 1520 DATA "E1D1C1093D20F1C3C105"
 1530 DATA "F33A485C0F0F0F260446"
 1540 DATA "2B10FED3FEEE10087CB5"
 1550 DATA "28030818F0FBC3C105"
```

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This is the machine code disassembly of a series of extended Basic routines which expand Sinclair Basic by up to 26 new commands, of the form '*name', ie., commencing with an asterisk, followed by a letter (upper or lower case) or word and any necessary parameters. (Note that this program only works with Interface 1 attached, and the system variable vector at 23735 and 23736 should be set to point to START.)

```
START   RST 10 GETCHAR
        CP "*"
        ;make sure 1st char is *
        JP NZ ERR6
        RST 10 NXTCHAR
        AND 9F
        CP +27
        ;check 2nd is within
        ;alphabetic range
        ;(very simple test so may
        ;fail with some chars)
        JR C INDEX
        XOR A
INDEX   ADD A,A
        LD HL,TABLE
        LD B,0
        LD C,A
        ADD HL,BC
        LD E,(HL)
        INC HL
        LD D,(HL)
        EX DE,HL
        JP (HL)
        ;jump to specific routine
        ;for each of the new 26
        ;commands
        ;subroutine to find the
        ;end of a word
SPACE   RST 10 CHADD
        CP " "
        RET Z
        CP ":"
        RET Z
        CP 0D
        JR NZ SPACE
        RET
```

The table of vectors to the specific routines.

```
ERR6   ;error vector
ERR6   ;vector for *A...     ERR6    ;*N
ERR6   ;*B...                ERR6    ;*O
ERR6   ;*C                   PRINT   ;*P
DRAW   ;*D                   ERR6    ;*Q
ERR6   ;*E                   ERR6    ;*R
ERR6   ;*F                   SCROL   ;*S
ERR6   ;*G                   ERR6    ;*T
ERR6   ;*H                   ERR6    ;*U
ERR6   ;*I                   ERR6    ;*V
ERR6   ;*J                   ERR6    ;*W
ERR6   ;*K                   ERR6    ;*X
ERR6   ;*L                   ERR6    ;*Y
ERR6   ;*M                   ZAP     ;*Z
```

This routine provides the command to carry out absolute drawing. It is used in the form *DRAW x,y (or *d x,y), where x and y are the co-ordinates of the point to be drawn to.

```
DRAW    CALL SPACE
        RST 10 EXPT1NM
        CP ","
        ;check for separator
        JP NZ ERR6
        RST 10 NXTCHAR
        RST 10 EXPT1NM
        CALL STEND
        ;now x & y are on the top
        ;of the stack
        RST 10 FNDINT1
        ;y co-ord into A
        LD HL,COORDS+1
        ;address of previous y
        SUB (HL)
        ;find relative y
        JR C DRAW2
        ;if -ve, adjust it
        LD D,1
DRAW1   LD B,A
        PUSH BC
        PUSH DE
        RST 10 FNDINT1
        POP DE
        POP BC
        LD HL,COORDS
        SUB (HL)
        ;same for x co-ord
        JR C DRAW3
        LD E,1
        JR DRAW4
DRAW2   LD D,FF
        NEG
        JR DRAW1
DRAW3   LD E,FF
        NEG
DRAW4   LD C,A
        RST 10 DRAWR
        ;perform actual drawing
        JP END1
```

You can print a UDG anywhere on the screen using the routine below. You access this ability using the command *PRINT x,y,c (or *p x,y,c), where (x,y) is the pixel co-ordinate of the top left of the character and c is the number of the UDG (A is '0', B is '1', and so on).

```
PRINT   CALL SPACE
        RST 10 EXPT1NM
        CP ","
        JP NZ ERR6
        RST 10 NXTCHAR
        RST 10 EXPT1NM
        CP ","
        JP NZ ERR6
        RST 10 NXTCHAR
        RST 10 EXPT1NM
        CALL STEND
        RST 10 FNDINT1
        SLA A
        SLA A
        SLA A
        LD D,0
        LD E,A
        LD HL,(UDG)
        ADD HL,DE
        ;HL contains the start
        ;of the required UDG data
        PUSH HL
        RST 10 FNDINT1
        PUSH AF
        RST 10 FNDINT1
        POP BC
        LD C,A
        ;BC contains the co-ords
        ;of the point to print to
        POP DE
        LD A,8
PRNT1   PUSH AF
        PUSH BC
        RST 10 PIXADD
        ;convert co-ords into an
        ;address and pointer in A
        PUSH AF
        PUSH HL
        PUSH DE
        RST 10 TEMPS
        ;set up colours
        RST 10 POATTR
        ;fill in attributes
        POP HL
        LD B,(HL)
        POP DE
        EX DE,HL
        POP AF
        LD C,0
        ;BC contains a byte of
        ;UDG data
        INC A
PRNT2   SRL B
        RR C
        DEC A
        JR NZ PRNT2
        ;shift data along to the
        ;correct pixel within the
        ;screen byte
        LD (HL),B
        INC HL
        LD (HL),C
        ;put it on the screen
        POP BC
        DEC B
        INC DE
        ;next line
        POP AF
        DEC A
        JR NZ PRNT1
        JP END1
```

This part of the program provides a pixel scroll in any of four directions; the command is used in the form *SCROLL n (or *s n), where n specifies direction.

```
SCROL   CALL SPACE
        RST 10 EXPT1NM
        CALL STEND
        RST 10 FNDINT1
        AND 3
        ;take n mod 4
```

```
        JR Z SCRL0
        ;scroll right
        CP 1
        JR Z SCRL1
        ;scroll up
        CP 2
        JR Z SCRL2
        ;scroll left
        JR SCRLB
        ;scroll down
SCRL0   LD A,+192
        ;no of lines on screen
        LD HL,+16384
        ;start of screen
SCRL3   AND A
        ;clear carry
        LD B,+32
        ;no of bytes per line
SCRL4   RR (HL)
        ;shift 1 bit right
        INC HL
        ;next byte on line
        DJNZ SCRL4
        DEC A
        ;next line
        JR NZ SCRL3
        JP END1
SCRL2   LD A,+192
        LD HL,+22527
        ;end of screen
SCRL5   AND A
        LD B,+32
SCRL6   RL (HL)
        ;shift 1 pixel left
        DEC HL
        DJNZ SCRL6
        DEC A
        JR NZ SCRL5
        JP END1
SCRL1   AND A
        ;reset carry
        LD DE,+16384
        ;1st byte of screen
        LD B,3
        ;no of 'sections' to
        ;be scrolled
SCRL7   PUSH BC
        LD A,8
        ;no of character lines
        ;per section
SCRL8   EX AF
        LD A,7
        ;no of pixel lines per
        ;character - 1
SCRL9   LD H,D
        LD L,E
        INC H
        ;HL points to next pixel
        ;line
        PUSH HL
        LD BC,+32
        LDIR
        POP DE
        DEC A
        JR NZ SCRL9
        LD BC,+1792
        SBC HL,BC
        ;adjust pointer to start
        ;of next character line
        PUSH HL
        LD BC,+32
        LDIR
        POP DE
        EX AF
        DEC A
        JR NZ SCRL8
        LD BC,+1760
        ADD HL,BC
        LD D,H
        LD E,L
        LD BC,+32
        SBC HL,BC
        ;adjust pointer for next
        ;screen section
        EX DE,HL
        LDIR
        POP BC
        DJNZ SCRL7
        LD HL,+22496
        LD B,+32
        ;now clear the last line
SCRLA   LD (HL),A
        ;A already contains 0
        INC HL
        DJNZ SCRLA
        JP END1
SCRLB   LD DE,+22527
        ;last location on screen
        LD B,3
SCRLC   PUSH BC
        LD A,8
SCRLD   EX AF
        LD A,7
SCRLE   LD H,D
        LD L,E
        DEC H
        PUSH HL
        LD BC,+32
        LDDR
        POP DE
        DEC A
        JR NZ SCRLE
        LD BC,+1792
        ADD HL,BC
        PUSH HL
        LD BC,+32
        LDDR
        POP DE
        EX AF
        DEC A
        JR NZ SCRLD
        LD BC,+1760
        SBC HL,BC
        LD D,H
        LD E,L
        LD BC,+32
        ADD HL,BC
        EX DE,HL
        LDDR
        POP BC
        DJNZ SCRLC
        LD HL,+16384
        LD B,+32
        JP SCRLA
        ;clear top line
```

This last routine provides better sound effects. The command is used in the form *ZAP n (or *z n), where n specifies whether you require an explosion, a falling tone or a rising tone.

```
ZAP     CALL SPACE
        RST 10 EXPT1NM
        CALL STEND
        RST 10 FNDINT1
        AND A
        JR Z ZAP0
        CP 1
        JR Z ZAP1
        CP 2
        JR Z ZAP2
        LD (IY+0),0A
        RST 28
        ;integer out of range
        ;error code
ZAP1    LD BC,180
        LD HL,10
        JR ZAP3
ZAP2    LD BC,FEFF
        LD HL,1820
ZAP3    LD DE,4
        LD A,10
ZAP4    PUSH BC
        PUSH DE
        PUSH HL
        PUSH AF
        RST 10 BEEPER
        ;make short burst of tone
        POP AF
        POP HL
        POP DE
        POP BC
        ADD HL,BC
        ;change frequency
        DEC A
        JR NZ ZAP4
        JP END1
ZAP0    DI
        LD A,(BORDCR)
        RRCA
        RRCA
        RRCA
        ;A=border colour
        LD H,4
ZAP5    LD B,(HL)
        DEC HL
ZAP6    DJNZ ZAP6
        ;'random' delay to
        ;produce white noise
        OUT FE,A
        ;activate speaker
        XOR 10
        ;toggle speaker on/off
        EX AF
        LD A,H
        OR L
        JR Z ZAP7
        EX AF
        JR ZAP5
ZAP7    EI
        JP END1
```

RST 10h followed by the starting address (this is true for all the new command routines).

PRINTING PIXELS

The next routine allows a user-defined graphic character to be placed anywhere on-screen. The reason for restricting it to UDGs is that it's unlikely that anyone would want to print a lot of text like this (since the routine handles only one character at a time) and, if required, the UDGs may be re-defined as letters.

The syntax for the command is:

```
*PRINT x,y,c
```

Where (x,y) are the pixel co-ordinates of the top left corner of the character (x lies between zero and 255, y between zero and 175) and c is the number of the UDG (UDG A is zero, UDG B is one . . . UDG U is 20). For example:

```
FOR x=0 TO 247: *PRINT x,100,0: NEXT x
```

The above will glide the first UDG (initially a capital 'A') across the screen. This time the extended syntax checker looks for three numbers separated by commas.

In the runtime routine, the data for the UDG is found and shifted across to give the correct information for the screen memory; the listing contains the code and full comments. The routine ends with the attribute bytes being set to the permanent colours.

PIXEL SCROLL

The scroll command allows pixel scrolling of the entire screen. The actual command is:

```
*SCROLL n
```

Where n is a numeric expression controlling the direction of the scrolling (n must lie between zero and 255, but only the mod four value is used):

n=0 (or 4,8,. . .) scrolls right one pixel
n=1 (or 5,9, . . .) scrolls up
n=2 scrolls left
n=3 scrolls down

For example, to scroll one whole character down, you could use:

```
FOR f=1 TO 8: *SCROLL 3:NEXT f
```

This moves the screen by eight pixel lines. The syntax checker this time looks for only one numeric argument. Only the lower two bits are used (giving a range of zero to three) and the routine jumps to each separate scrolling routine. The left and right scrolls are fairly simple — they just shift each line of 32 bytes by one bit. The up and down scrolls are complicated by the layout of the screen memory, but all they do is move each line into the one above or below, clearing the final one.

The colour attributes are not affected at all, since they have only character block and not pixel resolution.

SIMPLE SOUNDS

The final routine is a simple sound effects generator — useful for games if nothing else. The command syntax is:

ROUTINE	VALUE	COMMENT
GETCHAR	18	Fetches current char on BASIC line into A
NXTCHAR	20	Fetches next char, ignoring spaces
ERR6	1F0	Normal error handler
STEND	5B7	Subroutine to exit command routine in syntax check time
END1	5C1	Routine to exit in runtime
EXPT1NM	1C82	Syntax checker for expecting a numeric expression (puts it on the stack)
FNDINT1	1E94	Fetches number into A from stack
BEEPER	3B5	Loudspeaker routine HL=437500/freq-30.125 DE=freq*duration
CHADD	74	Reads next character including spaces
BORDCR	+23624	System variable holding attributes for the lower screen and border
STACKA	2D28	Puts A on to the calculator stack
COORDS	+23677	System variable holding x & y co-ordinates of last point plotted
DRAWR	24BA	Relative draw routine, takes x & y offsets from BC & DE registers
PIXADD	22AA	Converts co-ords in BC to an address in HL
UDG	+23675	System variable holding address of user-defined graphics data
POATTR	BDB	Sets attributes for the screen byte in HL
TEMPS	D4D	Sets temporary colours (used by POATTR) to the permanent colours

The ROM routines and addresses used by the program.

```
*ZAP n
```

Where n, between zero and two, specifies the type of sound:

n=0 gives an explosion noise
n=1 gives a falling tone
n=3 gives a rising tone

For example:

```
FOR f=1 TO 100: *ZAP INT(RND*3):NEXT f
```

The above will give several seconds of 'exciting' sounds (well, more exciting than BEEP!). The computer again looks for a single argument and checks its value; if it's out of range, it gives an error, otherwise it jumps to the specific routine. The rising and falling tones are produced by short beeps of changing frequencies, while the explosion is produced by sending 'random' data from the ROM to the speaker port.

A COMMANDING LEAD

You can check from the assembler listing several important points about adding new commands:

1. First, the syntax is checked — using EXPT1NM for numeric expressions and CP "," to check for separating commas. This section ends with CALL STEND.
2. Next comes the runtime routine and, since the values of the arguments are on the calculator stack, these can be pulled off into the A register with FNDINT1.
3. The runtime code ends with a jump to END1.
4. Any subroutine in the Basic ROM must be called via RST 10h. Note that all registers are preserved while the ROMs are paged.
5. Before the code will run, the vector at 23735 must point to the beginning, with a jump back to ERR6 at the end to trap genuine syntax errors.

The code may be entered using either an assembler or the Basic program provided which will relocate the 559 bytes of machine code anywhere in memory; it should run on a 16K Spectrum, so long as Interface 1 is connected.

To use it, set lines 10 and 20 to the desired starting address (for example, 31000 in a 16K machine and 64700 in a 48K model). Next SAVE the program in case there is a mistake (which is usually fatal in machine code). Now, RUN the program and after a few minutes a message will appear on the screen; the code has been located in memory but will have no effect since the vector at 23735 has not been altered. To use the extra commands enter the line in the message — as a single line rather than two separate POKEs, otherwise the machine may crash.

If NEW is entered the vector is reset; however, the code is still in memory, so repeat the two POKEs to allow the commands to be used. We've seen a simple interpreter that will allow up to 26 new commands, but with only four examples; there are 22 more possible words, so get working!

ASSEMBLER NOTES

The assembler used was the Artic version which, in fact, is slightly non-standard. The main differences between it and a standard assembler are:

EQU is replaced by the '=' sign.
All numbers are in hexadecimal unless preceeded by '+' or '−', in which case they are in decimal,
DEFB, DEFW, and so on do not exist; the number or label is simply placed in the source text where the DEFB would occur, and EX AF,AF' is entered as EX AF. S

CHANNELS AND STREAMS

As promised in our July issue, Ian Beardsmore continues his quest to open up a new stream to a new channel. Read on and check out his progress . . .

Last issue, I was rambling on about streams and channels, hoping to excite the nerve endings of any readers out there who could help me in my quest to open up this little-known area of Spectrum knowledge. Well, for all those of you still asleep in the back row, I've managed to come up with most of the answers — so, this month, I will be providing you with a routine to open a new stream to a new channel!

OPENING TIME

Opening a stream can be performed simply though various POKEs — the problem comes in creating a new channel. Whereas the streams area is absolute (the start of which is pointed to by the systems variable STRMS) the systems variable CHANS holds an address or vector which can, and does, move.

All this work was done on a Spectrum devoid of an Interface 1 unit, though the routine should be usable with said unit attached. Unexpanded, the Spectrum uses seven channels: −3 to −1 are for internal use, leaving Channels 0 to 3 for us to do something with. However, if we do use one of these it will have to be at the expense of the screen, keyboard or printer (yer pays yer money, etc). Much better, then, to create new space filled with channel data of our own channel — hence the need to CALL the 'make space' routine from the ROM!

As far as Sinclair Research is concerned the stream number is synonymous with the channel number, and as such is a source of confusion. While it's a useful rule of thumb, it's not a necessity. In theory, it would be quite possible to have, say, 16K of channel space . . . but there are limitations — namely that only stream and channel numbers between zero and 15 (inclusive) will be accepted. In the example I have given, the output routine of our new channel — Channel 4 — points to an

	ASSEMBLER	COMMENTS
This is a short set-up routine, making some room in memory for our new channel.	LD HL, (PROG)	Because the precise place we want within the channels area can be awkward to find, here is a little bit of cheating as we go in backward from PROG.
	DEC HL	This is a prerequisite of the CALL we are going to use.
	LD BC,0005	Another prerequisite. This is the size of the space we want to make.
	CALL # 1655	This is a CALL to the 'make space' routine within the Spectrum's ROM. HL has to point to the first byte after the space and BC needs to hold the length of the space. When the program has RETurned from the 'make space' routine, HL will hold the last byte of the space.
We can now fill our newly created space in the CHANS area with our own data. A check back to last month will reveal that the first two bytes will form the output routine (the one we will use), the next two form the input routine and lastly, the specifier (which must be K, S, R or P.) We will stick to Channel 3 and use 'P'.	INC HL	HL now holds the address of the first byte of our extra space.
	LDA, #94	The lowest significant byte (LSB) of our output routine.
	LD (HL),A	This is now loaded into the first of our free addresses.
	INC HL	The next of our extra addresses go into HL.
	PUSH HL	We are going to need this address again later.
	LD A, #F2	The most significant byte (MSB) of our routine.
	LD (HL), A	This is loaded into its allocated address.
	INC HL	The next free address — the start of the input routine.
	LD A, #C4	The LSB of the input error routine,
	LD (HL),A	Which is stored away.
	INC HL	The next free address,
	LD A, #15	And the MSB for it,
	LD (HL),A	Is stored away.
	INC HL	The next address,
	LD A, #50	Is the code for the letter 'P', our specifier.
	LD (HL),A	Without a recognized specifier, we would go to an error routine whether we wanted to or not.
Having made the space of our channel and loaded it with the data we want, the offset has to be found so that it can be stored in the STRMS area.	POP HL	The first address plus one of the extra space that we stored with a PUSH earlier.
	LD DE,(CHANS)	The vector that will return the start address of the channels area to DE.
	AND A	Clears the carry flag ready for calculation.
	SBC HL,DE	The difference between the start of the channels area and the start of the extra space we've made becomes our offset; it's currently held in HL.
	EX DE,HL	We need to keep the offset, but HL is in demand for other things. A simple swop, then, is the answer. HL is free for other uses, and the offset is in DE. All that's needed now is to find the place in STRMS where the channel offset can be stored.
	LD HL,'STRMS'	This is not a vector, and has to be loaded as an absolute value or else HL will be incremented.
	LD A,4	The stream we are interested in goes into the A register.
	ADD A,3	This allows for Streams -3 to -1.
	ADD A,A	Each of the seven streams that come into use on powering up the Speccy have two bytes of offset data allocated to them. The total number of bytes they occupy is now in the accumulator and forms our streams offset for Stream 4.
	LD B,0	It must not be forgotten that, even though we're using low value offsets, an offset can still be a two-byte number and in these cases must be treated as such.
	LD C,A	The LSB of the offset.
	ADD HL,BC	The streams offset is added to the streams base address, to give the location we want in the streams area.
	LD (HL),E	The LSB of our channel offset goes into the lower of the streams addresses.
	INC HL	Points to the next streams address.
	LD (HL),D	Loads that address with the MSB of our channel offset.
	RET	RETurns to Basic.

CHANNELS AND STREAMS

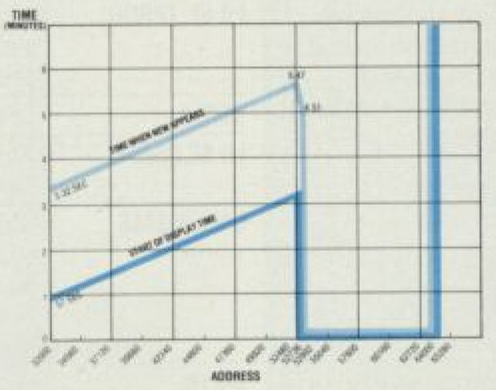
address 62100, where it is presumed that a routine of our own devising would be stored.

A note about offsets is also needed. An offset is a number that, when added to the base address of a block of data, will give you the address to start working from. The routine included in this article uses two offsets: one a channel offset, to show where the channel data for our routine starts; the other, a streams offset, is the number of bytes into the streams area that the above offset is stored.

I said last month I was hoping to assemble a routine that would allow you to attach your own streams to your own channels — the channels being your own routines. This proved even more awkward than I had expected and took some time to accomplish. For the present, I'll only give the assembly listing and explanation.

One point to keep in mind when trying to CLOSE channels greater than Channel 3 — there's no endstop marker on the Lookup Table, which might just have some of you whizzing merrily through the ROM until the program finds some number that's acceptable. YS

CRASH THEORY CONTINUED



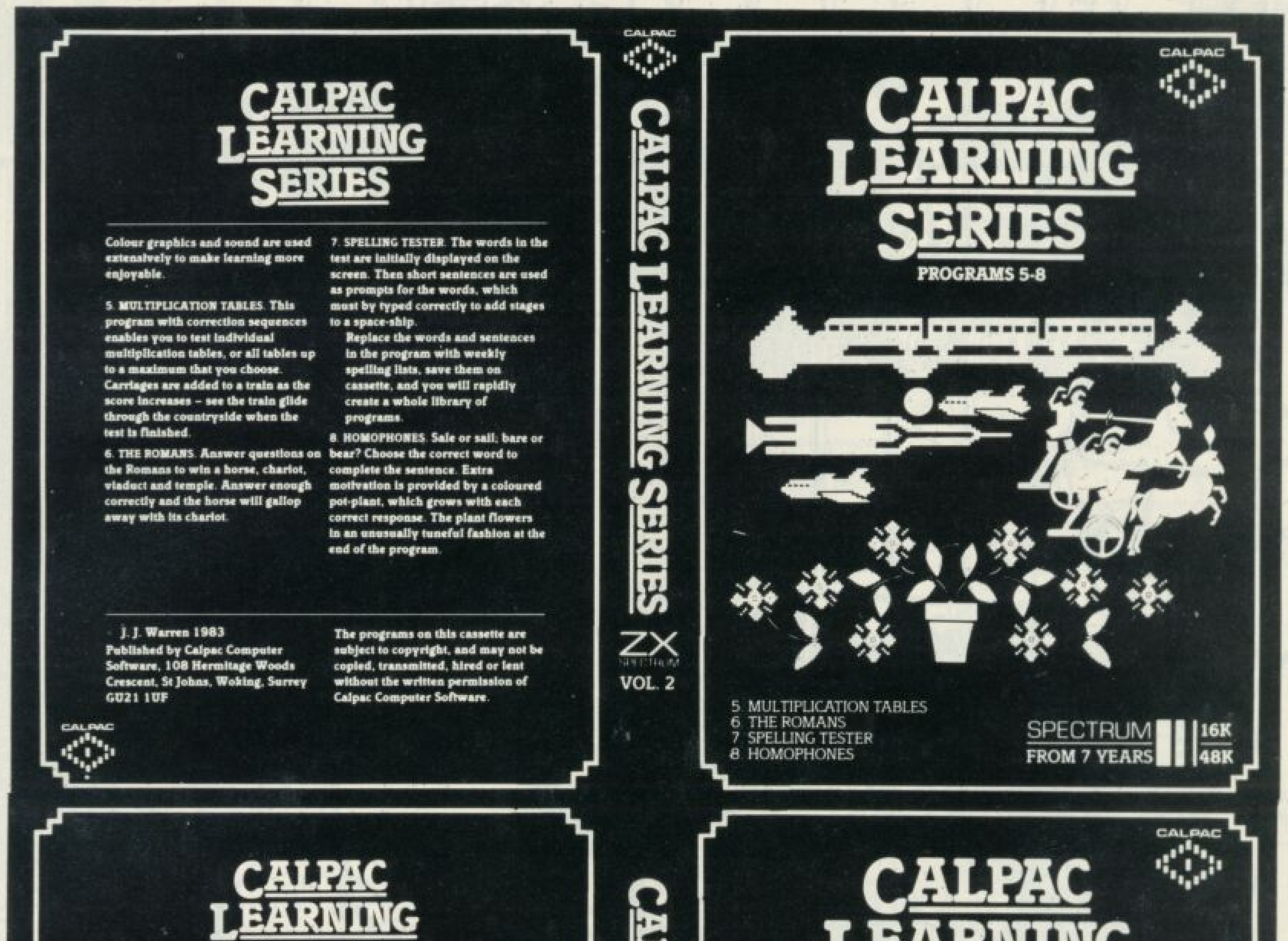
Further investigations into the 'Fun Crash' I gave you last month (well, it's a lot less energetic than a Fun Run!) have shown that CLEAR 64000 is not quite unique, even though it does seem to have some properties that are distinctly its own. But, in fact, a similar effect can be obtained with these addresses — 33024, 41472 and 51465; can anyone spot what they have in common? If highly intelligent readers of *Your Spectrum* cannot, then no one will. And what if I add a couple more addresses that can also be used, such as: 32000, 32256, 32512, 49152...?

Yes, no prizes for knowing that any address with a low byte value of 00 Hex will produce a similar sort of crash, though with nothing like the same spectacular pattern. I started to wonder what was so special about every 256th number that it produces a screen display, whereas any other (leastways, the others I've tried) results in a simple crash. Then I discovered that the incomparable Sir Clive had another trick up his sleeve — my fine theory itself crashes, literally, at address 52736.

So far as I know, only one address above this produces a display before the crash — when the computer NEWs itself — and that's the well-tried (and far more interesting) 64000. But, hang on... "Before the computer crashes and NEWs itself...", do I hear you exclaim? That wasn't mentioned before! Well, I was just testing your alertness. The fact is that though 64000 seems to produce a continuous display, all the other addresses mentioned earlier do it to a regular time sequence.

Here's a very exciting graph — well, maybe not that exciting, but still quite interesting. The y axis represents time in minutes, and the x axis the address (always remembering that only every 256th address applies). There's a clear relationship between when the display starts coming up on-screen and when it NEWs itself. Obviously, the three addresses — 52480, 52736 and 52992 — are the interesting ones, as here the pattern is completely broken, never to be repeated. I have left the 64000 display on for half an hour without it NEWing, so I make the assumption that it's permanent.

Now, all I want are some explanations ... any takers?



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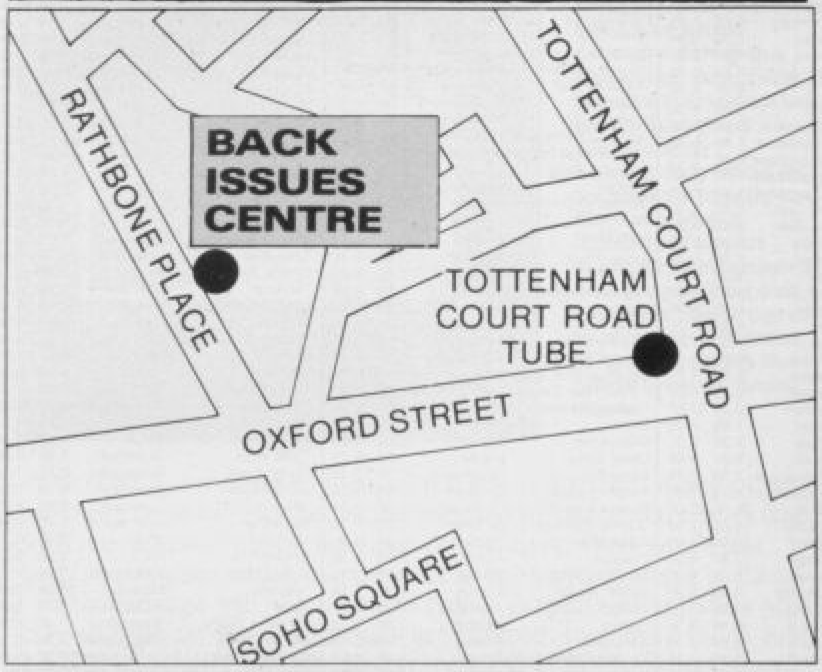
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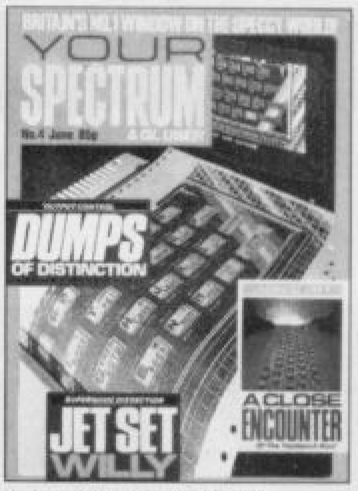
VOL 1/2 (FEB/MAR 1984)

REVIEWS
Printer interfaces, QL — the first impressions, machine code textbooks.
FEATURES
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GAMES
The *Ant Attack* map.



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REVIEWS
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FEATURES
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VOL 1/4 (JUNE 1984)

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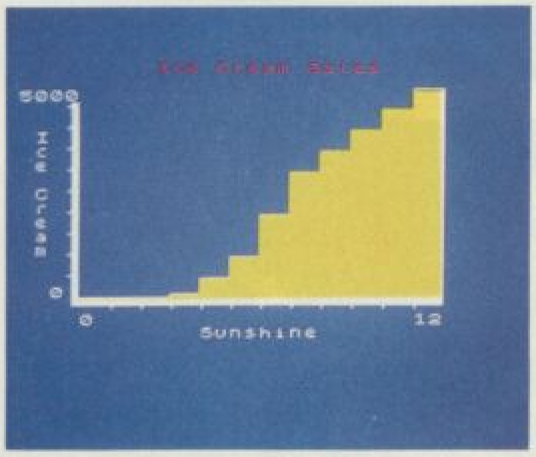
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PROGRAM POWER

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BUSINESS GRAPHICS

BY JOHN TYDEMAN



The bar chart shown here has been created using the *Business Graphics* program and can be either hatched (shaded) or completely filled in, as well as totally re-drawn using a different format such as histogram or line graph. You can also use the program to overlay different graphs in much the same way as *Easel* does.

With the QL looming so high on the micro horizon, many of you out there must have looked at the bundled software that comes free with the machine with something akin to envy. Well, don't fret ... here's a program which can produce graphs and charts, à la *Easel.*

This package will allow you to create graphics of any data you care to type in; several formats are offered, including block line graphs, bar charts, straight line graphs, bar charts and histograms. You can also fill above and/or below the graphs with colour, either as a solid fill or 'hatching'; there are 17 different shades of 'hatch' allowed. Once the graph/chart has been drawn, you can overlay another of a similar or different format, add labels (letters only can be positioned anywhere on the screen), SAVE it to tape,COPY it to a printer or start again — the choice is yours.

The program comes complete with comprehensive instructions on how to enter data, and is menu-driven to boot. A word of advice though, to start with don't try to draw too many graphs at once; it's something that needs a little planning to achieve the best results. Also, be restrained in the use of colour and 'hatch' options until you're familiar with the program, otherwise it could lead to some confusion. If the filling-in options run too slow for your purpose, try speeding them up with the Softek *FP Compiler* — you'll find it's fully compatible.

```
  10 REM  BUSINESS GRAPHICS
  90 REM  SET VARIABLES
 100 LET h=0
 110 LET c1=0
 120 LET c=0
 150 LET t=0
 160 LET co=0
 170 POKE 23609,185
 180 LET k1=0
 200 INK 5: PAPER 0: BORDER 0
 310 CLS
```

Lines 90-310 Define certain variables, POKE in a keyboard bleep, set the screen attributes and clear the screen.

```
 590 REM  MENU
 600 PRINT  INVERSE 1;"**************MENU****
**********"
 610 PRINT AT 4,0;"[1] Single or Multiple Lin
e        Graph - Variable Entry Both     Axi
s"
 620 PRINT AT 8,0;"[2] Block Line Graphs-Mult
iple      Entry - Variable Entry         Ver
tical Axis"
 630 PRINT AT 12,0;"[3] Solid Deviation Bar C
hart          suitable for Income /          EX
penditure and Max / Min."
 640 PRINT AT 16,0;"[4] Open Deviation Bar Ch
art"
 650 PRINT AT 18,0;"[5] Histogram"
 660 PRINT AT 20,0;"[6] Instructions"
```

Lines 590-660 Print the main menu, offering a choice of five graphs or instructions.

```
 700 INPUT "SELECT APPROPRIATE NUMBER ";ta
 702 IF ta=6 THEN  GO TO 8900
```

Lines 700-702 Select the type of graph; if you choose option six (instructions), the program GOSUBs to line 8900.

```
 703 REM  DRAW GRID
 705 INPUT " background colour (0-7)";bc: PAP
ER bc: BORDER bc: CLS
 730 INPUT "COLOUR OF GRID ?    (0 TO 7)";z: I
NK z
 740 INPUT "TYPE OF GRID? :RECT.=(1) : L=(2)N
ONE=(3) ";gr: IF gr=1 THEN  GO TO 1000
 750 IF gr=3 THEN  CLS : GO SUB 1025: REM TIT
LES
```

Lines 703-750 Select the grid type and colour.

```
 760 IF gr=3 THEN  INPUT "MAX VERTICAL VALUE?
 ";a: LET x=a: INPUT "No.ENTRIES/MAX HORZ VAL
";a: LET y=a: GO TO 3068
 770 CLS
 810 FOR n=3 TO 17: PRINT  INK z;AT n,3;"▌":
NEXT n: PRINT  INK z;AT 18,3;"▀"
 820 FOR n=4 TO 27: PRINT  INK z;AT 18,n;"▀":
 NEXT n
 830 GO TO 1025
1005 CLS : FOR n=4 TO 27: PRINT AT 2,n;"▄";AT
 18,n;"▀": NEXT n
1010 FOR n=3 TO 17: PRINT AT n,3;"▐";AT n,28;
"▌": NEXT n
1020 PRINT AT 2,3;"▗";AT 2,28;"▖";AT 18,3;"▝"
;AT 18,28;"▘"
```

Lines 760-1020 Input values for vertical and horizontal scales, clear the screen and draw the graphs with scales.

```
1025 INPUT ;"TITLE INK COLOUR? ";i
1030 INPUT ;"TITLE (22)";f$
1036 LET n=4+(INT (24-LEN f$)/2)
1040 PRINT  INK i;AT 1,n;f$
1050 INPUT ;"TITLE VERT. AX. (12)";h$
1060 LET nh=2+(INT (16-LEN h$)/2)
1065 IF gr=1 THEN  FOR m=1 TO LEN h$: PRINT A
T nh,30;h$(m): LET nh=nh+1: NEXT m
1066 LET nh=2+(INT (16-LEN h$)/2)
1070 FOR m=1 TO LEN h$: PRINT AT nh,1;h$(m):
LET nh=nh+1: NEXT m
1080 INPUT ;"TITLE HOR. AX.(22)";v$
1090 PRINT AT 20,4+(INT (24-LEN v$)/2);v$;
1095 IF gr=3 THEN  RETURN
```

Lines 1025-1095 Input graph and scale titles, the chosen colour, and print them justified on the screen.

```
3000 INPUT "MAX VAL VERT AXIS ";x: INPUT "MAX
 VAL HOR AXIS ";y
3010 PRINT AT 19,4;"0";AT 17,2;"0"
```

```
3020 PRINT AT 19,28-LEN STR$ y;y
3030 LET v=3-LEN STR$ x: IF v<0 THEN  LET v=0
3035 PRINT AT 3,v;x
3050 INPUT "NUMBER DIVISIONS IN VERT AXIS";a
3055 LET b=120/a: FOR n=1 TO (a-1): PLOT  INK
 z;28,INT (n*b)+33: DRAW  INK z;-2,0: NEXT n:
 IF gr=1 THEN  FOR n=1 TO (a-1): PLOT  INK z;
228,INT (n*b)+33: DRAW  INK z;2,0: NEXT n
3060 INPUT "No.ENTRIES/DIVS.IN HORZ AXIS";a
3065 LET b=192/a: FOR n=1 TO (a-1): PLOT  INK
 z;INT (n*b)+33,28: DRAW  INK z;0,-2: NEXT n:
 IF gr=1 THEN  FOR n=1 TO (a-1): PLOT  INK z;
INT (n*b)+33,156: DRAW  INK z;0,2: NEXT n
```

Lines 3000-3065 Input horizontal and vertical values, and the number of divisions/entries. This routine then prints the markers.

```
3067 REM  GOSUB DRAW GRAPH ROUTINES
3068 IF ta=5 THEN  GO SUB 6000
3069 IF ta=3 OR ta=4 THEN  GO SUB 5000
3070 IF ta=1 OR ta=2 THEN  GO SUB 3500
```

Lines 3067-3070 GOSUB to draw the type of graph selected.

```
3200 REM  OPTIONS - FILL - ANOTHER GRAPH - LA
BELS - SAVE - COPY
3210 PRINT #0;AT 0,0;"FILL BELOW GRAPH (Y/N)
                                         ": P
AUSE 0: IF INKEY$="y" OR INKEY$="Y" THEN  INP
UT "INK?";z: INPUT "Hatching:1(solid) to 16(o
pen)";ha: GO SUB 8200
3220 PRINT #0;AT 0,0;"FILL ABOVE?  GRAPH (Y/N
) ": PAUSE 0: IF INKEY$="y" OR INKEY$="Y" THE
N  INPUT "INK? ";z: INPUT "Hatching:1(solid)
to 16(open)";ha: GO SUB 8300
3225 PRINT #0;AT 0,0;"OVERLAY ANOTHER GRAPH (
Y/N) ": PAUSE 0: IF INKEY$="Y" OR INKEY$="y"
THEN  INPUT "SELECT GRAPH TYPE (1-5)";ta: GO
TO 3068
3230 PRINT #0;AT 0,0;"ADD LABELS?            (
Y/N) ": PAUSE 0: IF INKEY$="y" OR INKEY$="Y"
THEN  PAUSE 10: GO SUB 8600
3250 PRINT #0;AT 0,0;"HARD COPY?
                                         ": P
AUSE 0: IF INKEY$="y" OR INKEY$="Y" THEN  INP
UT "": COPY
3300 PRINT #0;AT 0,0;" COPY ON TAPE?": PAUSE
0: IF INKEY$="y" OR INKEY$="Y" THEN  INPUT ""
: SAVE "graph"CODE 16384,6912
3350 PRINT #0;AT 0,0;"DRAW ANOTHER GRAPH?": P
AUSE 0: IF INKEY$="y" OR INKEY$="Y" THEN  CLE
AR : GO TO 100
```

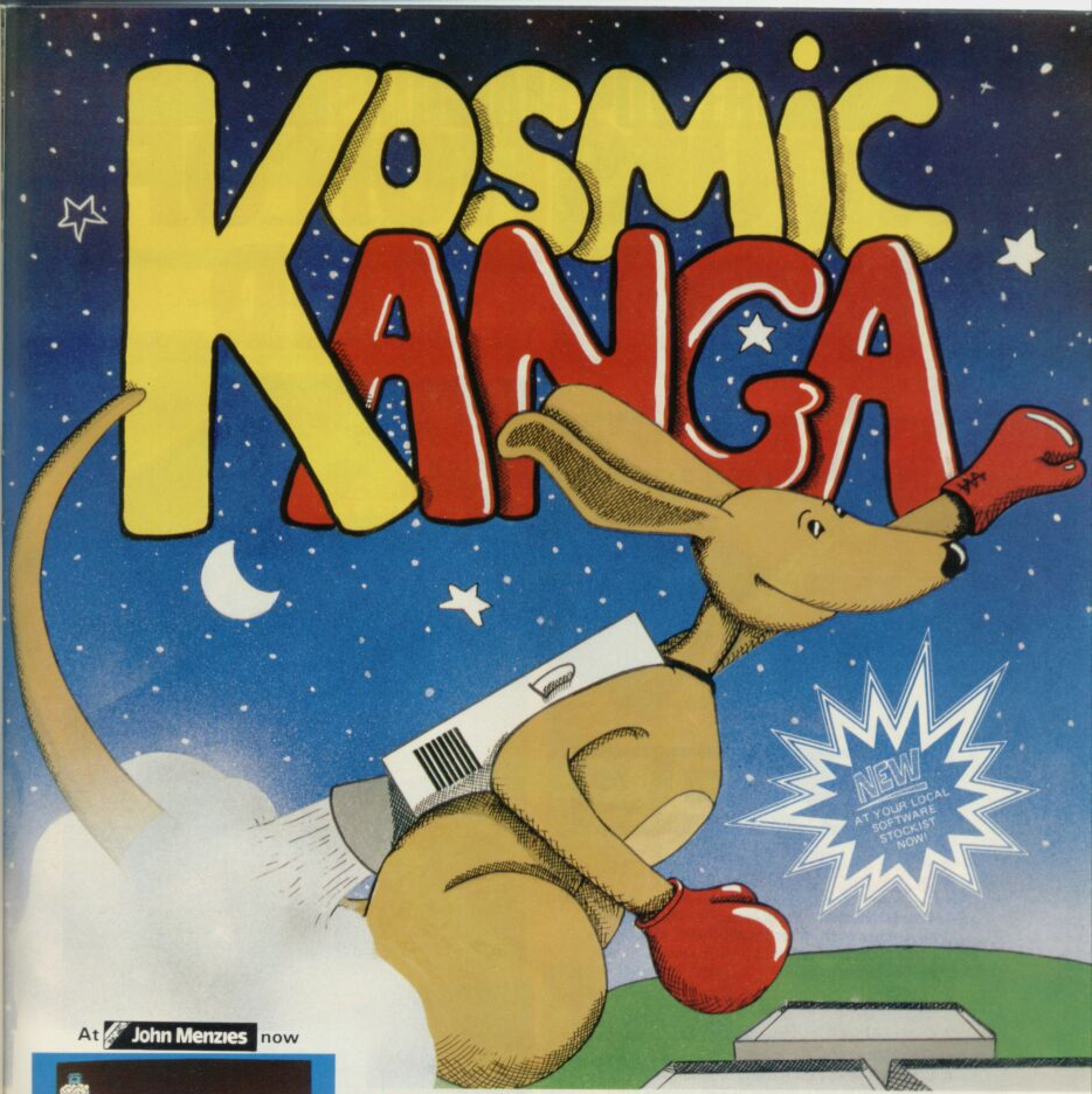
Lines 3200-3350 Once the graph is drawn, you are offered a number of options: 1) Is shading required above and/or below the graph?; 2) Is another graph to be overlayed?; and finally, 3) Is the graph to be SAVEd to tape?

```
3400 STOP : REM  END OF PROGRAM
```

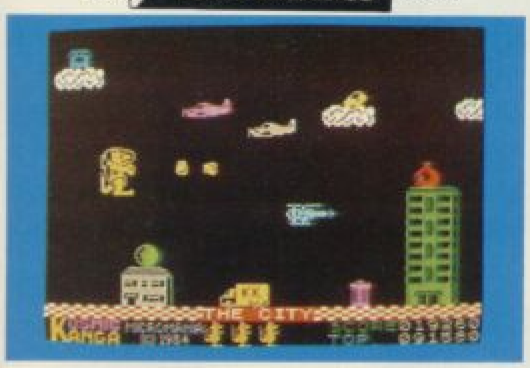
Lines 3400 The end of the program.

```
3690 REM  DRAW GRAPHS 1 & 2
3700 INPUT "Colour of Graph?";w:
3750 IF ta=2 THEN  GO SUB 4500: RETURN : REM
 GRAPH 2
4005 INPUT "FIRST VERTICAL ";c
4006 LET c=INT (c*(119/x))+32
4007 IF c>=151 THEN  LET c=150
4008 IF c<=32 THEN  LET c=33
4010 LET t=32: PLOT  INK w;t,c
4020 LET a=t: LET b=c
4060 INPUT "Vertical ";c;,;"Horizontal ";t
4070 IF t=0 THEN  GO TO 4120
4080 LET t=INT (t*(191/y))+32: LET c=INT (c*(
119/x))+32
4085 IF c=32 THEN  LET c=33
```

Lines 3690-4085 Get the colour of graphs 1 and 2. If graph 2, the program skips lines 4005-4210 which are for graph 1 only.



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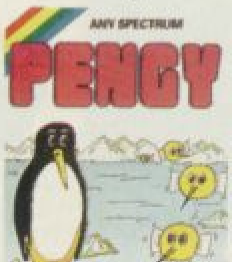
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```
4090 IF t>223 OR c>151 OR t<o OR c<32 THEN  P
RINT #0;AT 0,0;"INVALID ENTRY.TRY AGAIN.": BE
EP 1,1: PAUSE 100: GO TO 4060
```

Line 4090 Rejects data if outside the program's range.

```
4100 DRAW  INK w;t-o,c-b
```

Line 4100 Draws part of the graph.

```
4105 PRINT #0;AT 0,0;"TO CORRECT PRESS C :Nex
t Graph  Press N:ANY OTHER KEY CONTINUE. ": P
AUSE 0: IF INKEY$="C" OR INKEY$="c" THEN  INV
ERSE 1: PLOT t,c: DRAW -((t-o)),-((c-b)): INV
ERSE 0: PLOT  INK w;o,b: GO TO 4060
4106 IF INKEY$="n" OR INKEY$="N" THEN  GO TO
4120
4109 LET o=t: LET b=c
4110 BEEP 1/10,1/10: GO TO 4060
4210 RETURN
```

Lines 4105-4210 This routine provides an option to delete the last entry. The use of '1/10' and not '0.1' is to enable the use of Softek's **FP Compiler.**

```
4500 REM  DRAW GRAPH
4510 LET t=32
4520 INPUT "Vertical";c
4540 LET c=INT (c*(119/x))+32
4550 IF c>=151 THEN  LET c=150
4560 IF c<=32 THEN  LET c=33
4562 PLOT  INK w;t,c
4563 FOR n=1 TO (a-1)
4565 LET t=INT 192/a
4570 DRAW  INK w;t,0
4571 IF n>1 THEN  PRINT #0;AT 0,0;"TO CORRECT
 PRESS C :  QUIT = Q  :ANY OTHER KEY TO CONTI
NUE       ": PAUSE 0: IF INKEY$="C" OR INKEY$=
"c" THEN  PLOT  INVERSE 1;PEEK 23677,PEEK 236
78: LET n=n-1: INVERSE 1: DRAW  INK w;-t,0: D
RAW  INK w;0,-(c-c1): INVERSE 0: GO TO 4575
4573 LET c1=c
4574 IF INKEY$="Q" THEN  GO TO 10
4575 INPUT "Vertical";c
4581 LET c=INT (c*(119/x))+32
4582 IF c>151 OR c<32 THEN  PRINT #0;AT 0,0;"
INVALID ENTRY.TRY AGAIN.": BEEP 1,1: PAUSE 10
0: GO TO 4575
4590 DRAW  INK w;0,c-c1
4600 NEXT n
4605 DRAW  INK w;223-PEEK 23677,0
4700 RETURN
```

Lines 4500-4700 This routine controls the drawing of graph 2. Notice the PEEKs in line 4571, which address the system variables to delete the last point plotted.

```
5000 REM  DRAW GRAPHS 3 & 4
5010 LET t=INT 192/(a*4)
5015 INPUT "COLOUR FOR POSITIVE? (1 - 7)";ca:
 INPUT "COLOUR FOR NEGATIVE? (1 - 7)";cb
5020 FOR n=0 TO a-1
5030 INPUT " FIRST VALUE? ";c: INPUT " SECOND
 VALUE? ";f
5031 IF f>x OR f<0 OR c>x OR c<0 THEN  PRINT
#0;AT 0,0;"INVALID ENTRY.TRY AGAIN.": BEEP 1,
1: PAUSE 100: GO TO 5030
5035 IF c>=f THEN  LET i=ca
5036 IF c<f THEN  LET i=cb
5040 LET c=INT ((119*c)/x): LET f=INT ((119*f
)/x)
5041 IF c+32>=150 THEN  LET c=c-1
5042 IF f+32>=150 THEN  LET f=f-1
5045 LET t=INT ((n*(192/a))+(192/(a*4)))
5050 IF ta=3 THEN  FOR m=0 TO INT (192/(a*2))
: PLOT  INK i;t+32,f+32: DRAW  INK i;0,c-f: L
ET t=t+1: NEXT m
5060 IF ta=4 THEN  PLOT  INK i;t+32,f+32: DRA
W  INK i;0,c-f: DRAW  INK i;INT (192/(a*2)),0
: DRAW  INK i;0,-(c-f): DRAW  INK i;-INT (192
/(a*2)),0
5070 IF i=0 THEN  LET n=n-1: NEXT n
5080 IF k1=1 THEN  LET k1=0: INVERSE 0: GO TO
 5030
5100 PRINT #0;AT 0,0;"TO CORRECT PRESS C :  Q
UIT = Q   ANY OTHER KEY TO CONTINUE       ": P
AUSE 0: IF INKEY$="C" OR INKEY$="c" THEN  INV
ERSE 1: LET k1=1: GO TO 5045
5110 IF INKEY$="Q" OR INKEY$="q" THEN  CLS :
CLEAR : GO TO 1
5210 NEXT n
5220 RETURN
```

Lines 5000-5220 The routine controlling the graphic construction of graphs 3 and 4.

```
6000 REM  DRAW GRAPH 5
6010 INPUT "Colour of Graph? ";w:
6020 LET t=32
6030 FOR n=1 TO a
6040 PLOT  INK w;t,32
6050 INPUT "VERTICAL? ";c
6057 IF c>x OR c<0 THEN  PRINT #0;AT 0,0;"INV
ALID ENTRY.TRY AGAIN.": BEEP 1,1: PAUSE 100:
GO TO 6050
6060 LET c=INT (c*(119/x))
6070 IF c>=151 THEN  LET c=150
6100 LET ti=INT 192/a
6110 DRAW  INK w;0,c: DRAW  INK w;ti-1,0: DRA
W  INK w;0,-c
6160 PRINT #0;AT 0,0;"TO CORRECT PRESS C :  Q
UIT = Q    ANY OTHER KEY TO CONTINUE       ": P
AUSE 0: IF INKEY$="C" OR INKEY$="c" THEN  INV
ERSE 1: DRAW  INK w;0,c: DRAW  INK w;-(ti-1),
0: DRAW  INK w;0,-c: INVERSE 0: GO TO 6050
6170 IF INKEY$="Q" OR INKEY$="q" THEN  CLS :
CLEAR : GO TO 1
6180 LET t=t+ti
6190 NEXT n
6200 RETURN
```

Lines 6000-6200 The routine controlling graph 5. (The first part of lines 6160, 5100, 4571 and 4105 is the same, should this have been in the subroutine?)

```
6205 REM  FILL ABOVE
8210 FOR n=33 TO 222 STEP ha: LET b=0
8220 IF POINT (n,b+32) THEN  GO TO 8250
8230 IF b=117 THEN  GO TO 8250
8240 LET b=b+1: GO TO 8220
8250 PLOT  INK z;n,32: DRAW  INK z;0,b: NEXT
n
8260 RETURN
8300 REM  FILL BELOW
8310 FOR n=33 TO 222 STEP ha: LET b=151
8320 IF POINT (n,b) THEN  GO TO 8350
8330 IF b=32 THEN  GO TO 8350
8340 LET b=b-1: GO TO 8320
8350 PLOT  INK z;n,150: DRAW  INK z;0,-(149-(
b-1)): NEXT n
8360 RETURN
```

Lines 6205-8360 The fill routines. (These fill above and below the graph and are **very** slow. If you are going to use them a lot you may like to speed them up a bit. Try placing them at the start of the program).

```
8590 REM   ADD LABELS
8600 BEEP 1/20,1/20
8610 PRINT #0;AT 0,0;"Move Cursor (5-6)  Ente
r to QuitNo number/graphics:Delete=Space"
8615 LET x=1: LET y=1
8620 PRINT  OVER 1; INK 8;AT x,y;"*": PAUSE 3
: PRINT  OVER 1; INK 8;AT x,y;"*"
8630 LET t$=INKEY$
8640 IF t$="7" THEN  LET x=x-1: IF x<=0 THEN
```

```
 LET x=0: BEEP 1/50,1/50: GO TO 8620
8650 IF t$="8" THEN  LET y=y+1: IF y>=31 THEN
  LET y=31: BEEP 1/50,1/50: GO TO 8620
8660 IF t$="5" THEN  LET y=y-1: IF y<=0 THEN
 LET y=0: BEEP 1/50,1/50: GO TO 8620
8670 IF t$="6" THEN  LET x=x+1: IF x>=21 THEN
  LET x=21: BEEP 1/50,1/50: GO TO 8620
8680 IF t$=CHR$ (13) THEN  RETURN
8700 IF CODE t$>=32 AND CODE t$<=47 OR CODE t
$>=58 AND CODE t$<=127 THEN  PRINT  INK 9; PA
PER 8;AT x,y;t$: BEEP 1/10,1/10: LET y=y+1: I
F y>=31 THEN  LET y=31: GO TO 8620
8800 GO TO 8620
```

Lines 8590-8800 Add labels to the completed graph. Lines 8630-8670 check for the cursor keys being pressed and move the cursor. Line 8700 inputs text at the cursor.

```
8900 REM  INSTRUCTIONS
8910 CLS
8920 PRINT  INVERSE 1;"INSTRUCTIONS": PRINT
8930 PRINT "BUSINESS GRAPHICS is a program  d
esigned to produce charts and  graphs. The re
sultant display   may be photographed to prod
uce  lecture slides, copied to tape, or print
ed.": PRINT
8940 PRINT "Upon entering the program you   w
ill be presented with a Menu    offering a cho
ice of two graph  and three chart modes": PRI
NT
8950 PRINT "The program offers a choice of  g
rid, vertical scale, and numberof entries. Yo
ur own Titles willalso be printed. These shou
ld belimited to 22 charactors for     horizont
al and 12 for vertical.": PRINT
8960 PRINT #0;AT 0,0;"ANY KEY TO CONTINUE": P
AUSE 0
8970 CLS
```

Lines 8900-8970 The first page of instructions; these are printed page by page. Notice how lines 8920, 8960 and 8970 appear five times — the use of a subroutine would have been much better.)

```
8980 PRINT  INVERSE 1;"INSTRUCTIONS": PRINT
8990 PRINT "At various stages you will be   g
iven the option to overlay      another graph
or chart of your  choice from the menu.": PRI
NT
9000 PRINT "You will be given the option to d
elete the last entry when       entering data.
": PRINT
9010 PRINT "Ink colour may be selected      t
hroughout the program and thereis an initial
option to select  the background colour.
     Use of colour should be          restrain
ed for the best results particularly where di
fferent    graphs will be close to one      an
other": PRINT
9020 PRINT #0;AT 0,0;"ANY KEY TO CONTINUE": P
AUSE 0
9030 CLS
```

Lines 8980-9030 Page 2 of the instructions.

```
9040 PRINT  INVERSE 1;"INSTRUCTIONS": PRINT
9050 PRINT "After drawing a graph you        m
ay choose to fill above or       below the grap
h and enter simplelabels.": PRINT
9060 PRINT  INVERSE 1;"GRAPH SELECTION": PRIN
T
9070 PRINT "Graph (1) is a simple line graphw
hich permits variable selected entry on the v
ertical and        horizontal axis. All the ot
her  modes require a defined number   of entri
es for the horizontal    axis.": PRINT
9080 PRINT "Charts (3) and (4) permit two    s
ets of data to be entered         together. If t
he second   entry exceeds the first the graph
     will be a different colour."
```

```
9090 PRINT #0;AT 0,0;"ANY KEY TO CONTINUE": P
AUSE 0
9100 CLS
```

Lines 9040-9100 Page 3 of the instructions.

```
9110 PRINT  INVERSE 1;"INSTRUCTIONS": PRINT :
 PRINT : PRINT
9120 PRINT "Lower Case is employed          t
hroughout the program. When     entering title
s and labels        Capitol Letters may be ente
red  using CAPS SHIFT or CAPS LOCK.": PRINT :
 PRINT : PRINT
9130 PRINT "When entering labels no         c
olour option is given nor is itpossible to us
e graphics or      numbers. To delete an incor
rect label position the cursor over  the firs
t letter and use space": PRINT
9140 PRINT #0;AT 0,0;"ANY KEY TO CONTINUE": P
AUSE 0: CLS
```

Lines 9110-9140 Page 4 of the instructions.

```
9150 PRINT  INVERSE 1;"INSTRUCTIONS": PRINT :
 PRINT : PRINT
9160 PRINT AT 6,0;"It will be neccesary to
     experiment with different graph combina
tions. Modes 1 and 2      combine satisfactori
ly with any others. Both bar charts work     w
ell together providing you      watch the colo
ur combinations.  It is suggested that charts
 3   and 4 only be used with chart    5 if hor
izontal entries are not above 12. Again watch
 colour     choice."
9170 PRINT #0;AT 0,0;"ANY KEY TO CONTINUE": P
AUSE 0: CLS
```

Lines 9150-9170 Page 5 of the instructions.

```
9200 GO TO 310
```

Line 9200 Returns to menu.

```
9999 SAVE "busgraph" LINE 1
```

Line 9999 The 'cassette SAVE' routine.

CHIP CHAT

BY STEPHEN STRATFORD

Talking Spectrums! Yes, it's possible — using this neat 82 byte machine code program. Any speech or noise recorded on a cassette can be reproduced on the Speccy; all that's needed is a bit of care and a few precautions.

Those of you with access to an assembler program will be able to make use of the main listing without too many problems. The only thing to bear in mind is that the Hex numbers are prefixed by the hash (#) symbol.

If you haven't got an assembler, no need to panic — simply type in the machine code loader program and enter the data provided. If you manage to make an error, this will be indicated and you'll have to start over. If there are no errors recorded, the program will then SAVE and VERIFY the code to cassette; if you have a Microdrive, change lines 40 and 50 of the loader program as required

To use the program you must reserve some room for the speech data by typing CLEAR 32767 — this will provide space for about five seconds worth of speech data (being stored from location 32768 to 65099). You can always lower or raise RAMTOP if you wish to have longer or shorter periods of speech respectively.

First of all, you must prepare a cassette recording of the five seconds of speech (or any other noise) that you wish to record on the Speccy. Type RANDOMIZE USR 65100, *but do not press Enter.* Press the Play button on your cassette recorder and, just as the prepared speech is about to start, press Enter. About five seconds later, the 'OK' message should pop up on-screen. If you pressed Enter too early, you can abort the program by hitting the Space key.

To hear the recorded speech, type RANDOMIZE USR 65139 ... and listen very carefully. You may experience a lot of background noise on your recording but there are one or two things you can do to aleviate this problem:

1. Remove the MIC lead when playing the speech into the Spectrum.
2. Record your own voice, speaking in a loud and clear fashion.
3. Experiment with the tone and volume controls of your cassette machine until you get the best results.

To SAVE your speech data to tape, type:

SAVE "DATA SP" CODE (n+1), 65182 — (n+1)

Where n was the number used in the original CLEAR statement. Have fun!

Below is the assembler listing of *Chip Chat* — note that the Hex numbers are prefixed by the hash (#) symbol.

LINE	LABELS	MNEMONICS	COMMENTS
10	;	ORG 65100	
20			
30	HEAR	RST#38	Increments the FRAMES counter and scans the keyboard.
40		DI	
50		LD HL,(RAMTP)	
60		INC HL	HL=RAMTOP+1.
70	LOOP2	LD B,8	The number of bits per type.
80	LOOP	LD A,#7F	
90		IN A,(#FE)	A test is made to see if the Space key has been pressed.
100		RRA	
110		JR NC,STOP	
120		BIT 5,A	A test is made to check that there is a signal at the EAR port.
130		IN A,(254)	
140		JR NZ,NO!	
150		SET 7,(HL)	
160	JOIN	RLC (HL)	There is a signal at the EAR port, so save it.
170		DJNZ LOOP	Repeat for all eight bits.
180		INC HL	
190		CALL OVER	A check is made for the 'end of data' space.
200		JR C,LOOP2	If there is more room in memory, then read more data.
210	STOP	EI	End of data recording.
220		RET	
230	NO!	RES 7,(HL)	No signal has been stored from the EAR port.
240		JR JOIN	
250	SPEAK	RST #38	
260		DI	
270		LD HL,(RAMTP)	
280		INC HL	
290	LOOP3	LD B,8	
300	LOOP4	P!T 7,(HL)	
310		IN A,(254)	
320		JR NZ,YES!	These lines perform similar functions to lines 30-240, except that the data is output to the Spectrum's speakers from its memory.
330		RES 4,A	
340	JOIN2	OUT (254),A	
350		RLC (HL)	
360		DJNZ LOOP4	
370		INC HL	
380		CALL OVER	
390		JR C,LOOP3	
400		EI	
410		RET	
420	YES!	SET 4,A	
430		JR JOIN2	

440 450 460 470 480 490	OVER	LD DE,HEAR PUSH HL AND A SBC HL,DE POP HL RET	These lines carry out the check for the 'out of data' space.
500 510 520 530 540	; RAMTP ; ;	 EQU 23730 END	System variable.

If you haven't an assembler at hand, use the following Hex loader program and enter the *Chip Chat* data given.

```
 10 CLEAR 65099: LET tot=0
 20 FOR o=65100 TO 65181 STEP 5: PRINT o;":
":: FOR h=0 TO 4: INPUT byte: POKE h+o,byte:
PRINT byte;" ";: LET tot=tot+byte: NEXT h: PR
INT : NEXT o
 30 IF tot<>11987 THEN  PRINT ''"There's an
error!": BEEP .2,-4: STOP
 40 SAVE "speechcode"CODE 65100,82
```

```
65100: 255 243 42  178 92
65105: 35  6   8   62  127
65110: 219 254 31  48  18
65115: 203 111 219 254 32
65120: 14  203 254 203 6
65125: 16  237 35  205 149
65130: 254 56  229 251 201
65135: 203 190 24  240 255
65140: 243 42  178 92  35
65145: 6   8   203 126 219
65150: 254 32  16  203 167
65155: 211 254 203 6   16
65160: 242 35  205 149 254
65165: 56  234 251 201 203
65170: 231 24  238 17  76
65175: 254 229 167 237 82
65180: 225 201 80  0   0
```

The data for the *Chip Chat* program — to be entered using the Hex loader above.

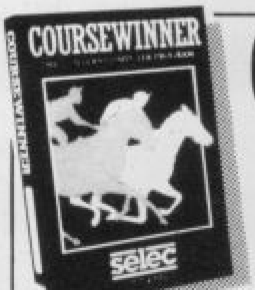
PROGRAMMING ON SPEC

Programs submitted for publication in *Your Spectrum* have a tendency to suffer a number of common faults — simple little quirks which can be rectified easily.

Our major gripe is that the display is often messy and untidy. A screen can be made so much more legible if it is well formatted — if spaces are left between lines of text and words are not split from line to line. And while we're on about screens, if you display something like the current score or whatever, do remember that labelling it makes all the difference — the whole effect becomes more user-friendly (to use a rather hackneyed phrase).

Above all, think of all the annoying aspects of listings you've experienced in your programming career — and make sure they don't happen in your programs. That said, the standard of contributions to *Your Spectrum* have been extremely high. So, if you want to see your programs — remember, we pay better than most, but they've got to be good!

Please send any programming contributions to:
Gavin Monk, Your Spectrum, 14 Rathbone Place, London W1P 1DE.





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HARDWARE

■ 64K ZX81 plus software, original cost £120, will accept £60. Phone 0992 719856.

■ Swop Downsway Programmable Joystick Interface for Sinclair Research Interface 2 — or sell for £15. Tel: Doncaster 883794 after 5pm (ask for Mike).

■ I have a Spectrum three-channel programmable sound board with Input/Output port — will exchange for ZX81 RAMpack and any ZX81 software. Phone 0208 2971 after 6pm.

■ Dk'Tronics Lightpen with software and instructions (cost £20) — will exchange for *Machine Code Made Easy*/16K Assembler, or *Compiler For Learners.* P Chapman, 1 School View, Easington Lane, Houghton-Le-Spring, Tyne and Wear.

■ Trojan Lightpen £10; PR Cooling Unit £5; *Century Programming Course* £7; *Bridge Tutor (Advanced)* £4; *Biorhythms* £4; *007 Spy* £3;, *Scrabble* £7. Phone 0388 772588.

■ Offers for 48K Spectrum, Interface 1, Microdrive and £100+ worth of software. Also Fuller Sound Box £25. Write to Mr RJ Ingram, Irelands, Goose Green, Warnham, Horsham, West Sussex RH12 3RS, stating your offer price.

■ Swop my ZX Printer + 2 rolls printer paper for Cheetah Sweet Talker or Currah MicroSpeech. N Osborn, 74 Coombe Lane, Westbury-On-Trym, Bristol BS9 2AY, Avon.

■ Currah MicroSpeech unit for Spectrum with manual and demo tape — boxed, £20. 69 Savoy Road, Dartford, Kent DA1 5AN. Phone (evenings) 0322 70320. Ask for JR Ball.

SOFTWARE

■ Swop educational software for 3-to-9 age group. I can offer *ABC, Lift-Off, Pathfinder, Wordspell, Quick Thinking, Party Time, Alphabet, Countabout* and *Time.* Phone 01-800 6767 after 7pm.

■ Swop either *Ten Little Indians, Time Machine* (originals) for either *Lords of Time, Waxworks, Wizard Akyrz, Feasibility Experiment,* or *Colossal Adventure* (originals). Phone Chester-Le-Street 881299 after 5pm (Chris).

■ Swop *Codename Mat, Millionaire, Sipper Flipper, Weather Station, Jack and the Beanstalk* for *Bridgemaster, Sinclair Chess Tutor,* Currah MicroSpeech. Contact Michael Tsui, Flat J, 26 Norham Gardens, Oxford, now!

■ *Tasword Two* Microdrive support, Softek *Floating Point Compiler,* both brand new, will swop for Hisoft *Pascal.* Must be latest version with turtle graphics. *Valhalla* will swop for *Hobbit.* 04215 65606.

■ Beat the pirates! Superb software protection for your Speccy programs. £5 for 16K and £10 for 48K. Send cheque and program to Gareth Jones, 38 Croft Avenue, Burscough, Lancashire L40 5TB.

■ I have three games for swopping: *Heathrow, 3D Tunnel, Pool.* In return I would like *Chequered Flag, Lunar Jetman, Trashman.* James Grigor, 24 Afton Court, Stirling EK7 7RB.

■ Would like to swop *Penetrator, Football Manager, Urban Upstart, Timegate, Molar Maul, Jumping Jack, Horace-Skiing, Gobbleman.* Particularly interested in adventures and any good games. Phone 0884 256052 (Tom).

■ Swop tapes: *Jet Set Willy, Melbourne Draw, Bridgemaster, Pools System, Trashman, Cyrus-15-Chess, Catell IQ, Snowman, Fred, Android 2, Splat! Ad Astra.* Plus 30 others. Phone 0734 697095 (Adrian).

■ Swop tapes. Required: *Jackpot, Splat!, Go To Jail, Pontoon, Millionaire, Draughts, Mazecube.* For: *The Crypt, Jetpac, Cookie, Ah Didums,* K-Tel *Doublesider, Mission Omega, Nightflight II, Frenzy.* Phone Lorraine on Johnstone 22932.

■ *Fighter Pilot* by Digital Integration. Will swop for *Jack and the Beanstalk, Chequered Flag and McKensie.* Contact S Elmer, 19 Brooksfield, Bildeston, Ipswich, Suffolk.

■ I have *Lunar Jetman, Deathcase, Zip Zap.* I will exchange all three for *The Hobbit.* Phone Castlewellan 78061 (Aidan).

WANTED

■ Microdrive and Interface 1 wanted — must work! Phone 0437 890563 after 8pm (ask for Stuart). Reasonable price offered.

■ Has anybody cracked the action game on *Jokers Wild?* If so, please supply the running code for the adventure. S Cheesman, 24 Hazelby Road, Creswell, Worksop, Notts.

■ Wanted — Alphacom 32 Printer or ZX Interface 1 plus Microdrive. Will swop £56 worth of software, plus Cambridge Programmable Joystick Interface worth £27. N Magowan, 46 Drumlough Road, Hillsborough, Co. Down BT 6PX.

PEN PALS

■ M/C games writer seeks like to swop ideas and programs. Also, to swop games and serious programs (I have 60 to date). Write to Alastair Pandelus, 22 Windsor Road, Renfrew PA4 O55.

■ I would like a penpal to share hints and tips, etc, on programming. Contact Steve Garrett, 139 Paignton Road, Millbrook, Southampton, Hants SO1 4BD. Phone 0703 787429.

■ Italian boys desire to correspond by letter or tape with users of the Spectrum. Write to Scala Fabio, via Pegaso, 7 47037 Rimini (FO), Italy.

■ I'd like a penpal please, about 14 years old. I like computing (especially games), tennis, football, reading, *Frankie Goes To Hollywood* and *The Thompson Twins.* Ask for Timothy on 031-445 3693.

MESSAGES

■ Software companies. Reformed hacker will produce a full report on how easy it is to crack your new protection routines! Write in confidence. P Ockendon, 156B Eastern Road, Brighton, East Sussex.

■ Help! Isolated and dispirited programmer needs advice re best software houses to write for, and suggestions on good Basic, M/C, education, psychology, management. All letters answered. Ann Menneer, 5 Nanpusker Road, Hayle, Cornwall TR27 5JR.

■ Can you help me? I'm looking for a Spectrum oriented computer club in SE or Central London. Please write to Tom at 20 Aylton Estate, London SE16 1JL.

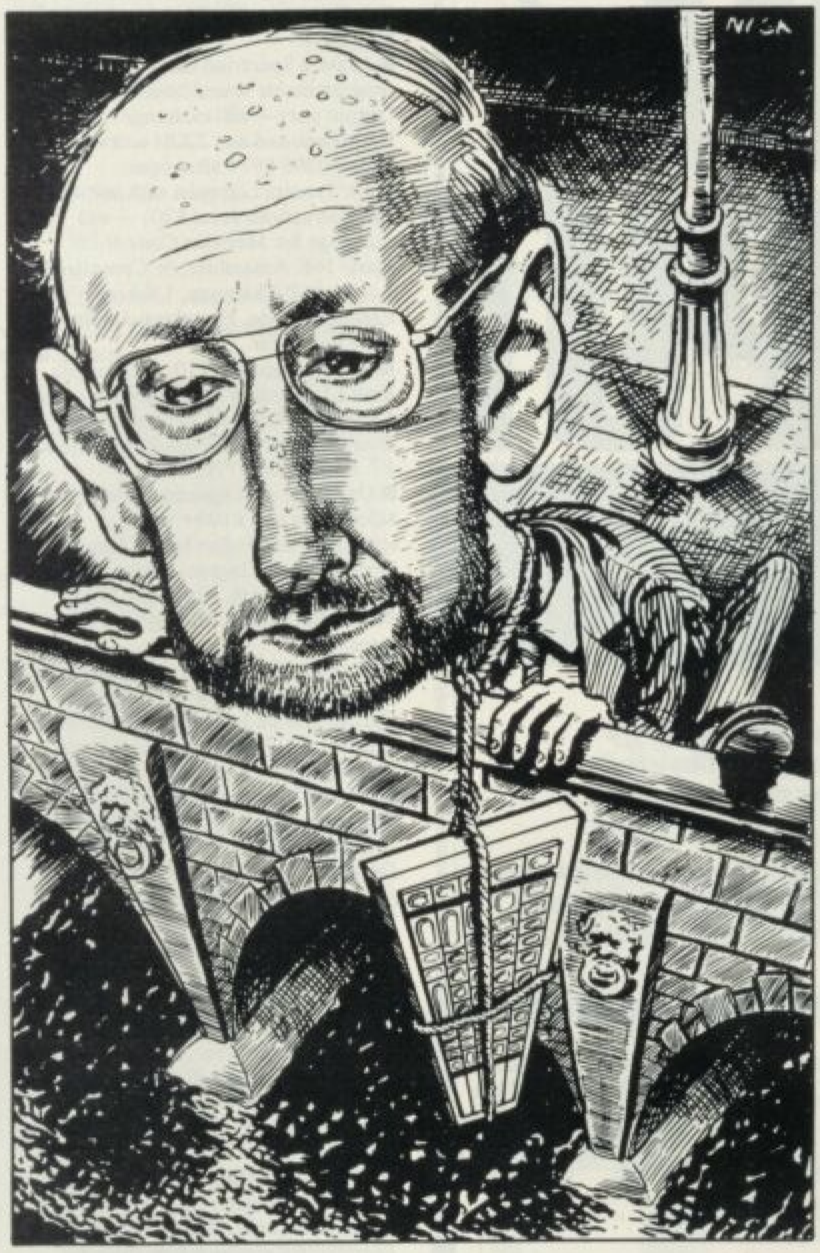
CLUBS & EVENTS

■ Sinclair Amateur Radio User Group for all Ham and SWL user details. SAE vital. Paul Newman, 3 Red House Lane, Leiston, Suffolk 1P16 4JZ.

■ Roche ZX Computer Club (Cornwall) 0726 890473. Meets Monday 7pm to 10pm, Friday 7pm to 9pm. Mike Richards.

■ Gloucester's midweekly Spectrum User Group welcomes hackers, gamesters, multicore solderers and also ZX81 users. Age, experience, gender unimportant. Phone 0452 23186 and meet others in a free and easy atmosphere. ACC affiliated. YS

Sinclair Research breaks the time-honoured tradition of 'never having to say sorry' over lunch at the Carlton Tower Hotel. **Roger Munford** *reveals the proceedings.*



LUNCH WITH SIR CLIVE

Holed up in a luxury suite of the Carlton Tower Hotel, high above London's West End, the crème de la crème of computer scribes (or so they'd like to think) sat down for lunch with Sir Clive Sinclair, plus henchmen Nigel Searle and David Karlin. Reason for the summit? To 'put the story straight' about the QL. Therefore, pulled in at no extra cost was king of the bundled software, David Potter of Psion.

"Reports in the press contained errors which we feel may be our fault — and this concerns us as any error in the British press will be seen around the world", began Sir Clive. The patriotic slant proved something of a tone-setter. "Putting the record straight" then switched to something of a slag-off of IBM, Acorn and Commodore — all of which, he claimed, had been equally (if not more) late with their own products. Warming to his theme, Sir Clive went on to tell us of the ecstatic welcome the QL had received in Japan and the US. Why, he inferred, couldn't the British press get it right!

Arming himself with a slide projector, Nigel Searle then attempted to allay fears that the QL was running behind schedule. He said the 28-day delivery should be okay by the time you read this and that there'll be an extensive revision of the User Guide by August — plus faster turnaround of upgraded QLs. He expects too to be announcing additional manufacturers of the add-ons soon. More interesting news is the fact that the 68000 family could be the one on which Sinclair Research will be basing its products for the next decade — "and it wouldn't surprise me if the 68000 was used into the decade after as well", quoth Searle.

Getting on to Microdrives (wake up all you Spectrum users) Searle asserted the simple market truth that once the demand goes up, then the price will come down. "I can't say when or how much, but it'll be significant". He went on to confirm that, yes, there have been the obvious comparisons with disks, but the techniques employed with Microdrives could eventually give them the technology to produce storage of up to 1M; that, apparently, is still on the drawing board.

Additional hardware support for the QL will include 128K RAM, 512K RAM, Winchester hard disk unit, modem and terminal emulator, monitor, printer and IEEE 488 interface. However, Searle wouldn't be drawn into the big question of 'when?'. Perhaps the company is going to wait and see what other manufacturers are going to do, and then just fill in the gaps.

Ending the presentation, Nigel Searle pronounced the QL to be a potential 'million seller' — 250,000 this year and 750,000 in 1985.

David Karlin has obviously picked up a few pointers from his boss on how to tackle the 'difficult' questions. Dealing with some of the more pedantic queries from those assembled, on the tricky subject of software bugs Karlin told us "of course, 'silly and convoluted' things will crash the machine — if you get the answer wrong through a 'complicated' expression, then this is not significant.... no Basic ever written is perfect — within that we are perfect".

And talking of getting 'complicated', David Potter managed to get himself in a mighty tangle over whether the Psion packages were 'multi-tasking' or 'concurrent'. Once he'd suitably defined the two in a way that showed the QL to be multi-tasking, the point was raised that it would be near impossible for the average punter to be able to do it anyway. David Karlin noted "the facilities are there for the software houses — and I believe that users who require it will learn 68000 machine code language". Hmmm.

Perhaps the whole point of the exercise was that Sinclair Research wanted to say sorry for being so late — certainly the press boys gave them every chance, again and again... even to the point where, in a harrassed moment, Sir Clive was heard to emit the strangled cry, "For God's sake, we're going to do it better". In the continuing barrage, Sir Clive went on, "we're not at all happy that we let people down. It takes a long time to launch a product — it's all a bit of a balancing act which we got slightly wrong. But the way we got it wasn't as bad as the opposition." Again, a loose reference to companies like Amstrad (which, according to Sir Clive, have introduced "an old-fashioned computer").

It was left to Nigel Searle to make Sinclair Research's peace. "I think honestly that it's very easy to have 20:20 hindsight — we could all do it better again. The difficult thing is to design products now which will be good in 1986. Nobody wants flak — and we get it in barrelfuls. We didn't want to be late this time, and we don't want to be late in the future."

That, one would imagine, is the final apology and, thankfully, Searle resisted any reference to 'other' companies; if the other companies don't want to say sorry for their lateness, then that's their bad manners — unless you're NANDing in Boolean, two wrongs still don't make a right. Sinclair Research 'suffers' from having a man at the top who is known throughout the world, and it's always 'nicer' to knock a person than a faceless company. On the other hand, you could argue that Sinclair Research wouldn't be in the position it's in now without the figurehead — a paradox which suggests those with a swings and roundabouts asset should learn to say sorry *nicely.*

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